



**FOREIGN
BROADCAST
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JPRS Report

Science & Technology

Central Eurasia

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Science & Technology

Central Eurasia

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[NOTE TO READERS: Effective 1 October, the processing indicators appearing in brackets at the start of each item will be changed. All new indicators will begin with "FBIS" to make the material more easily identifiable. Some will also indicate whether the item has been translated from the vernacular or transcribed from English.]

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**Decisions of Russian Academy of Sciences
Presidium Jan-Feb 94**

947A0067A Moscow VESTNIK ROSSIYSKOY
AKADEMII NAUK in Russian No 6, Jun 94
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[Unsigned article: "RAS Presidium Resolutions (January-February 1994)"]

[FBIS Translated Text] The Russian Academy of Sciences (RAS) Presidium has decided to:

Adopt the proposals of the Commission on State Stipends of the RAS Presidium and award to more than 4 thousand outstanding Russian scientists monthly state stipends in the amount of 75 thousand rubles and to more than 900 young Russian scientists monthly state stipends in the amount of 50 thousand rubles.

Approve M. V. Alfimov, corresponding member RAS, as chief editor of the ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII (Journal of Scientific and Applied Photography), RAS, for a new term.

Approve V. I. Goldanskiy, academician, as chief editor of the journal KHIMICHESKAYA FIZIKA (Chemical Physics), RAS, for a new term.

Approve V. M. Gryaznov, academician, as chief editor of the ZHURNAL FIZICHESKOY KHIMII (Journal of Physical Chemistry), RAS, for a new term.

Approve V. B. Kazanskiy, academician, as chief editor of the journal KINETIKA I KATALIZ (Kinetics and Catalysis), RAS, for a new term.

Approve A. K. Pikayev, corresponding member RAS, as chief editor of the journal KHIMIYA VYSOKIKH ENERGII (High Energies Chemistry), RAS, for a new term.

Approve N. A. Plate, academician, as chief editor of the journal VYSOKOMOLEKULYARNYYE SOYEDINENIYA (High Molecular Compounds), RAS, for a new term.

Approve the makeup of the presidium of the Ural Department RAS, elected by a general meeting of that department (presidium chairman—G. A. Mesyats, academician, first deputy chairman—V. A. Koroteyev).

Henceforth designate the State Geology Museum imeni V. I. Vernadskiy of the RAS and the Russian Federation State Committee for Higher Education as the State Geology Museum imeni V. I. Vernadskiy, RAS.

Organize the Kola Regional Seismological Center, RAS, as part of the Kola Science Center, RAS, with the prerogatives of an independent scientific research institute. The new institute should ensure operation of the regional network of the European sector of the Arctic and Subarctic, and also participation in operation of the national teleseismic network; organize an automated system for seismological observations, data storage and

processing, interacting with the NORSAP system (Norwegian Seismic Group); study the influence of anthropogenic activity on the geophysical medium, and also develop methods for reducing seismic risk in sectors of active engineering exploitation of the arctic zone. The Department of Geology, Geophysics, Geochemistry and Mining Sciences has been assigned scientific-methodological oversight of the Kola Regional Seismological Center, RAS. I. A. Kuzmin, candidate of physical and mathematical sciences, is designated its director-organizer.

Approve the presidium of the Kabardino-Balkarian Science Center, RAS, (chairman—P. M. Ivanov, doctor of technical sciences, deputy chairman—Kh. A. Kurdanov, doctor of medical sciences).

Abolish the Special Design Bureau of the Institute of Petrochemical Synthesis imeni A. V. Topchiyev, RAS, as an independent organization with the prerogatives of a juridical entity.

Name the Thermophysics Institute, Siberian Department, RAS, in honor of Academician S. S. Kutateladze.

Name the Nuclear Physics Institute, Siberian Department, RAS, in honor of Academician G. I. Budker.

Beginning with 1994 set the amount of prizes named in honor of outstanding scientists awarded by the Russian Academy of Sciences in the amount of 20 basic wage rates (salaries) in the first wage category in the Unified Wage Scale for the work payment of workers in organizations supported from the budget.

Organize a Systems Software Institute, RAS, on the basis of the division "Systems Software and Computer-Aided Design Systems" and the section "Basic Algorithms" of the Cybernetics Problems Institute, RAS. The new institute will be part of the Department of Information Sciences, Computer Equipment and Automation, RAS. The principal directions in scientific research of the Systems Software Institute are defined: software methodology, software engineering and new software paradigms; operating systems; software and compiler languages; man-computer interfaces and computer graphics; data and knowledge bases; algorithms for parallel and distributed systems. V. A. Ivannikov, corresponding member RAS, is designated director-organizer of the Systems Software Institute with subsequent confirmation under the established procedures.

Organize a High-Capacity Computer Systems Institute, RAS, on the basis of the Collective Use Computer Center, RAS, and the scientific subdivisions of the Cybernetics Institute, RAS (other than those included in the Systems Software Institute, RAS). The new institute is made part of the RAS Department of Information Sciences, Computer Equipment and Automation. The principal scientific research specializations of the High-Capacity Computer Systems Institute are defined:

research on the prospects for and formulation of concepts on the development of high-capacity computer and automated control systems (supercomputer and specialized computer systems); formulation of the principles for constructing superhigh-capacity computer systems on the basis of new physical principles for the processing, transmission and storage of information and with application of new principles for the organization of the computation process and computer architectures. Academician V. S. Burtsev is designated director-organizer of the High-Capacity Computer Systems Institute with subsequent confirmation under the established procedures.

Abolish the Collective Use Computer Center and the Cybernetics Problems Institute, RAS, due to the organization of the Systems Software Institute and the High-Capacity Computer Systems Institute, RAS.

In the RAS Presidium organize a Joint Scientific Council on Ecological Problems, made up of the RAS vice presidents in charge of departments whose institutes are involved in ecological research, the chairmen of the national committees of international organizations and programs with an ecological orientation, as well as the chairmen of scientific councils and commissions with an ecological orientation established in the RAS Presidium. The structure of the new council is approved; it includes: Central Office, Scientific Council on Biospheric Problems, Commission on Formulation of Conservation of Natural Waters Problems, Interdepartmental EPTS Coordinating Council (for radio ecology), Commission on Extraordinary Situations, Group for Scientific Monitoring of Ecological Programs and Group for Monitoring Nuclear Engineering Programs in the Central Office for Monitoring Scientific Programs of the RAS Presidium. Academician V. A. Koptug is assigned responsibilities as chairman of the RAS Joint Scientific Council on Ecological Problems. The task of drawing up regulations for the RAS Joint Scientific Council on Ecological Problems is assigned to the chairman and the Central Office.

Approve I. Sh. Akhatov, doctor of physical and mathematical sciences, as deputy chairman of the Ufimsk Science Center RAS.

Relieve O. L. Kryzhanovskiy, doctor of biological sciences, from his responsibilities as chief editor of the journal ENTOMOLOGICHESKOYE OBOZRENIYE (Entomological Review), RAS, because the term of his appointment has elapsed. Appreciation was expressed to him for his productive work in this assignment.

Approve G. S. Medvedev, doctor of biological sciences, as chief editor of the journal ENTOMOLOGICHESKOYE OBOZRENIYE, RAS.

Approve G. P. Georgiyev, academician, as chief editor of the journal GENETIKA (Genetics), RAS.

Designate D. M. Gvishiani, academician, as a counselor of the Russian Academy of Sciences.

Approve A. A. Boyarchuk, academician, as deputy chairman of the Space Council, RAS.

Designate S. N. Mergelyan, corresponding member RAS, as a counselor of the Russian Academy of Sciences.

Designate I. R. Shafarevich, academician, as a counselor of the Russian Academy of Sciences.

Beginning on 1 January 1994, increase the salary for the academic rank of full member of the Russian Academy of Sciences by a factor of 1.9. The pay for the academic rank of corresponding member RAS will be in an amount 50% of the salary for a full member RAS.

Support the proposal of the presidium of the Siberian Department RAS and the administration of Tomsk Oblast on the organization in Tomsk of the State Science Center "Computer Building and Development of New Materials for the Siberian Region" on the basis of Institute of Strength Physics and Materials Science, Siberian Department, RAS, and the Republic Engineering-Technical Center of that institute with the participation of a number of academic institutes and institutions of higher education.

Decree Awarding Supplementary Pay to Russian Scientists

947A0068A Moscow POISK in Russian No 29 (271),
5-11 Aug 94 p 2

[Unsigned article: "Decree of Russian Federation Government"; the first paragraph is a preface to the decree]

[FBIS Translated Text] Decree of the Russian Federation Government. On setting salaries for the ranks of full and corresponding members of the Russian Academy of Sciences, Russian Academy of Medical Sciences, Russian Academy of Agricultural Sciences, Russian Academy of Education, Russian Academy of Arts and Russian Academy of Architecture and Construction Sciences and supplementary pay for the academic degrees of doctor of sciences and candidate of sciences.

For the purpose of ensuring material support for Russian scientists the Russian Federation government decrees:

1. Beginning on 1 June 1994 the following will be established:

a salary for the rank of full member of the Russian Academy of Sciences in the amount of 20 and for the rank of corresponding member of the Russian Academy of Sciences in the amount of 10 minimum work salary levels;

a salary for the rank of full member of the Russian Academy of Medical Sciences, Russian Academy of Agricultural Sciences, Russian Academy of Education, Russian Academy of Arts and Russian Academy of Architecture and Construction Sciences in the amount of

14 and for the rank of corresponding member of these academies in the amount of 7 minimum work salary levels.

2. For full and corresponding members elected to two or more of the academies indicated in Section 1 of this decree the salary for the rank is paid in only one of the academies.

3. Beginning on 1 June 1994 the monthly additional pay for the academic degree of doctor of sciences is set in an amount 5 and for the academic degree of candidate of sciences is set in the amount of 3 minimum work salary levels for workers with staff assignments in budgeted scientific institutes (organizations) and institutions of higher education, regardless of their departmental affiliation, the academic degrees for which are covered in the wage rates and skills handbook, coordinated and approved under the established procedures.

4. The monthly additional pay for the academic degrees of doctor of sciences and candidate of sciences are not applicable for workers for whom the salaries have been set for the ranks of full member and corresponding member of the academies, as provided for by Section 1 in this decree.

5. The Russian Federation Finance Ministry is to determine the sources of funding for the expenditures related to the implementation of this decree.

6. It is recognized that the decree of the Russian Federation government No 1139, dated 4 November 1993, entitled "Some Conditions for Payment of Scientific Workers and Workers in Institutions of Higher Education" and decree No 56, dated 31 January 1994, entitled "Setting Salaries for Scientists With the Rank of Full Member and Corresponding Member of the Russian Academy of Agricultural Sciences, Russian Academy of Medical Sciences, Russian Academy of Education, Russian Academy of Arts, Russian Academy of Architecture and Construction Sciences," are now invalidated (Collection of Acts of the President and Government of the Russian Federation, 1993, No 46, page 4457; 1994, No 6, page 440).

Outcome of Three-Year Decline in S&T Funding Debated

947A0070A Moscow SEGODNYA in Russian 1 Sep 94
p 9

[Article by Vladimir Pokrovskiy: "Predictions and Threats. Period of Semidecay of Science Lasts Three Years"]

[FBIS Translated Text] Pessimism and optimism with respect to the future of Russian fundamental science is today expressed in Russia in accordance with the political biases of the sides. The Presidium of the Russian Academy of Sciences, the trade unions of workers of the Russian Academy of Sciences and the parliamentary faction "Russian Communists" especially stress the

calamitous situation of scientists and the criminal inattention to their needs on the part of the government. Their predictions are characterized by extreme gloominess and always come down to the very same assertion: "If the science budget is not increased today, science will perish tomorrow." Democrats, represented by Boris Saltykov, Minister of Science and Technical Policy, and Nikolay Vorontsov, chairman of the parliamentary subcommittee on science, do not deny the entire gravity of the situation but are full of optimism.

"I am sure that the principal scientific schools will survive," says Saltykov. Vorontsov, in the past a well-known biologist, in the example of his science speaks with enthusiasm about new and very promising developments, such as the appearance of a great many new journals in the English language by means of which many serious scientists, earlier unknown in the West, have been able to let themselves be known as highly "converted" researchers.

Both have responded positively to the highest degree to the recently established International Science Fund and the Russian Fund for Fundamental Research and the system of state science centers and other "point funding" mechanisms. Both essentially say that as a result of the crisis the first to suffer will be "unconverted" scientists and those who earlier received funding for their projects not so much due to their actual scientific status as due to the post they occupied, their connections, etc. However, most of the "converted" scientists will evidently be able to survive the difficult times by means of grants, participation in joint international projects and other types of scientific activity which bring in money.

Boris Saltykov has every basis for being an optimist. Precisely now he has been filled with the hope that Russian science has reached the bottom of the financial abyss to which it has fallen during all recent years with increasing acceleration and that a slow increase in budget support will begin in the autumn.

While evaluating the financial situation as critical and declaring that if at the beginning of the autumn there is no reexamination of budgeted expenditures on science, then "a serious drama will take place," Saltykov with great optimism reports on the first, for the time being still small victories in 1994 in the struggle for an increase in state science subsidies. The dropoff of inflation and some stabilization in the financial market also are allowing him to hope for the next, more impressive budget increases.

The financial optimism also is based on the fact that the International Science Fund has finally begun to hand out grants. In addition, Viktor Chernomyrdin, promising George Soros the allocation of 12.5 million dollars for ISP programs, despite all expectations, fulfilled his promises virtually without delay.

Nikolay Vorontsov also fulfilled the financial expectations. "Our subcommittee has already succeeded," he

states, "in almost doubling budget allocations for fundamental science and we have intended that this money be disbursed on a competitive basis."

It is true that an increase in state financial support, even if it occurs, will not be able to satisfy all present-day needs. "There will be more money," says Saltykov, "but in the foreseeable future it is uncertain that there will be a great deal more. We are unable to support everything which the Soviet Union had built up and no one needs that." Accordingly the science minister is devoting more serious attention to structural reform. The actions of the ministry in this direction are by no means being limited to the already established Russian Fund for Fundamental Research (RFFI) and the system of state science centers. In the immediate future, says Saltykov, a fund for supporting the humanities will be established which will operate on approximately the same principles as the RFFI.

Boris Saltykov lays very great hopes on the rapid introduction of a contract system for paying the wages of scientific specialists. Although many problems related to matters of social protection of scientists will certainly arise here, the contract system, as shown by experiments carried out at a number of institutes in Moscow and Novosibirsk, will enable the directors of institutes and the heads of major laboratories to attract talented young scientists if not with greater, in any case, with acceptable wages.

Boris Saltykov also has not abandoned hopes for establishing in Russia an institute of state professors—an idea torpedoed in autumn of last year by Yuriy Osipov, president of the Russian Academy of Sciences. We recall: alarmed by the danger of the appearance in Russia of several thousand scientists with thousand-dollar monthly stipends, which would result in a lowering of the status of the Russian Academy of Sciences and a sharp limitation of its authority, Yuriy Osipov succeeded in getting from Boris Yeltsin a decree instituting, in particular, the title "outstanding scientist," intermediate between doctor of sciences and corresponding member, Russian Academy of Sciences, with a stipend of 75 thousand rubles.

But the brain drain problem remains and is growing worse. As reported in the Ministry of Science and Technical Policy, 70-80% of the mathematicians have already left for abroad. The theoretical physicists are not that much far behind them. The idea of "state professors" has still not been forgotten, although over the course of a year it has experienced substantial transformations. Now it is proposed that this fund be used for the support of scientists in the age group up to 40 years. According to Saltykov, this idea has been supported by Viktor Chernomyrdin.

There also is basis for pessimism, expressed by the opposition. The state of funding is truly critical. The wages of scientists, most frequently being substantially lower than is the physiological subsistence minimum, at

times are not paid for several months. Like all Russian employees paid from the budget, scientific workers have been forced to moonlight and it is good luck if this work on the side is related to their main profession. The brain drain to the West and to commercial structures is supplemented by an underground but even more massive leakage when a person retains the status of a scientific specialist but due to the need for earning more money is no longer in a position to engage in serious science.

At a number of institutes concerned with both fundamental and applied science their directors are earning rather large sums by the leasing out of institute rooms or putting into circulation money intended for the payment of wages, setting for themselves exorbitantly high salaries, according to hearsay, up to 16-18 million rubles, whereas their scientific specialists are put on leave for many months without pay or continue experiments without receiving even a kopeck for their work. Some directors intentionally force their specialists to leave so as to lease out the additional space which they have left free.

This is reported by Dmitriy Katayev, deputy of the Moscow City Duma and it is confirmed by Boris Saltykov, who as usual does not name names. As Saltykov asserts, the reason here is that such situations are kept a dark secret and an accusation requires investigations, for which personnel are lacking. Moreover, today's imperfect legislation in actuality does not forbid such things.

But the most surprising thing, certainly, is that there have been no radical changes for the bad or the good for several years. The institutes are surviving, even if there is scarcely a glimmer of life in some of them; research is going on; scientists, although with a lag, are receiving their wages and going on foreign missions. All the directors remain in their posts. Already in 1992 analysts called the state of science "a situation at the bifurcation point," by this meaning that in the near future the situation would radically and unpredictably change. And this "point" is already being drawn out into the third year. The situation of unstable equilibrium, after a second look, is extremely stable.

Bankruptcy Threatens 'Secret' Defense Enterprises

947A0070B Moscow IZVESTIYA in Russian 30 Aug 94 p 2

[Article by Anatoliy Yershov, IZVESTIYA correspondent, Nizhny Novgorod: "'P. O. Box' Has Filed for Bankruptcy"; the first paragraph is an introduction]

[FBIS Translated Text] When the Nizhegorod Oblast Arbitration Tribunal examined the bankruptcy application of the NPP (scientific production enterprise) Salyut, the judicial procedure looked entirely ordinary. What was unusual was the fact that here for the first time two candidates were presented at the same time to serve as outside business manager.

The NPP Salyut is a typical "P. O. Box" which earlier had flourished on defense orders. Now the percentage of such orders has fallen off sharply and some of the workshops and production facilities are lying idle. The situation is being aggravated by the fact that finished items worth almost a half-billion rubles have piled up in the warehouses—the military clients are without funds. Plant personnel have received no wages since November of last year and the people, driven to desperation, filed suit in people's court against former director A. Chebotarev, who was fined 180 thousand rubles. There is a great turnover of personnel at the enterprise.

The financial situation of the NPP Salyut is such that its people are unable to extricate themselves independently from their present-day situation. Accordingly, the enterprise management has turned to the oblast arbitration tribunal with a request that it be declared bankrupt. The Salyut debts now amount to 5.2 billion rubles. For a long time the enterprise had borrowed from the Gazprombank and Radiotekhsbank and not rarely, even in hard currency. Much is owed to employees and other creditors.

In addition, an audit revealed that in the implementation of reorganization measures Salyut could rapidly master the production of goods which have a high scientific input and which are in short supply. For the time being construction has not yet been completed here on building No 3 and there are other unused capacities. Unfortunately, the enterprise management, as is clear from the statement of claim, has taken no steps for effectively breaking production down into smaller units and the marketing service here has remained undeveloped. Now, by decision of the arbitration tribunal, a moratorium has been imposed on the former debts of the defense "monster" and their repayment has been put off 1 1/2 years, which will afford the enterprise, so to speak, an opportunity to shake itself up and devote full energies to earning money. In the course of the hearing a tense moment arose related to the designation here of an outside business manager for the property of the indebted enterprise. The fact is that from the very beginning two candidates had been proposed. The arbitration tribunal under the chairmanship of V. Nogteva gave preference to G. Brzhezinskiy, who earlier had worked as a section chief at this enterprise. His program for getting the enterprise out of its blind alley, according to V. Nogteva, looked entirely convincing and well balanced. And now it only remains to wait and see how all this will work out in actual practice. Outside business management was set by the tribunal for a period of 18 months, as provided for by the law.

With respect to the other candidate for the role of outside business manager, I. Petyashin, in the past a director of a defense plant, was proposed by the Nizhegorod Territorial Agency for Bankruptcy Matters. V. Nogteva states that during the judicial proceeding he set forth his program of actions in the new role in "too generalized an overall way," which disappointed the

court... Since in the future there will be new bankruptcy proceedings, the Nizhegorod authorities are now seriously thinking about how in the immediate future it will be possible to prepare qualified local outside business managers because the need for such personnel is increasing.

Economic Methods for Managing Science Examined

947A0070C Moscow POISK 26 Aug-2 Sep 94 p 4

[Article by Vitaliy Tambovtsev, professor, laboratory head, Economics Faculty, Moscow State University imeni M. V. Lomonosov: "Ready for the Market? Economic Methods for Science Management"]

[FBIS Translated Text] The present-day sorrowful situation in national science scarcely needs to be described in detail—the situation is well known to readers. It will not shape up today nor tomorrow. As a point of reckoning, it appears, it is possible to take the year 1991, when hidden inflation began to become evident and ordinary supply mechanisms ceased to function. The preceding two years, however, in financial respects were a golden age for the sphere of scientific and technical development work: it is sufficient to recall the angry utterances of the then-time Chairman of the Council of Ministers N. Ryzhkov about the 90 base pays which the director of one of the planning institutes received as a prize... Precisely in those years, to be more precise, in 1989, scientific and technical production was declared to be a commodity and universal application of economic methods for science management was initiated.

Economic management methods—these are simply words to describe all that which makes it possible to exert an influence on the actions of a producer of goods (things, services or information), taking into account its striving to obtain a maximum profit to be used for its needs. This means that for the use of economic measures in management by some organizations and people it is necessary that these parties respond to appropriate stimuli. In other words, their behavior must be regulated—at least in part—by striving for the maximizing of profit. Accordingly, it is not enough to declare the activity of scientific research organizations to be the production of commodities—it is necessary to be further convinced that in actuality they are functioning as producers of commodities, are "economic entities" desiring to increase their income to the maximum degree.

It must be noted that even from the time of perestroika a certain percentage of scientific workers have been active outside the state sector—in cooperatives, small enterprises, etc., engaging there not in commerce, but in carrying out scientific and technical development work. The number of such organizations for the time being is relatively small, but it goes without saying that they cannot be excluded from Russian science. Logic suggests that precisely such organizations, selling scientific and technical products produced by themselves, should to a

maximum degree be "under the thumb" of economic management methods. The fact is that most scientific research institutes also, as is well known, have been "overgrown" by various small enterprises by means of which the specialists supplement their budget, satisfying the requirements of their clients. At such enterprises the general overhead is less and a greater part of the value of the orders is received directly by those doing the work. In the last analysis the very appearance of these small enterprises is nothing other than a healthy economic reaction to the conditions of operation of state scientific research organizations.

However, there is no need to convince the creators of scientific knowledge and other scientific and technical production that the reasons for their research, inventive and planning-design activity in many cases are far from economic. The worker at a scientific research organization may be guided by interest in what is new, a desire to enhance his prestige among his colleagues and a striving for fame—in short, a great many noneconomic considerations. However, the managers of scientific research organizations, forced to think by no means of just science (and even, possibly, far less), but also money, must be far more "economic" than strictly scientific workers. And, indeed, it is precisely the decisions of the managers which in large part govern the behavior of a scientific research organization in the market for scientific and technical goods.

Thus, science management by economic methods, through taxes, advantageous rates, credits, tariffs and other "standard" economic measures, is dependent on whether these influences are invoked by science itself in its organizational structure, in the person of the managers at scientific research institutes.

Only by knowing the receptivity of these people to economic stimuli is it possible to answer the question: what is post-Soviet science like with respect to reactions to economic stimuli—effective despite all the disadvantages to the community of creators, or, on the contrary, an unimportant economic branch incapable of finding its place in the universal market? Or neither one nor the other, but a mix of "normal" market participants, very simply experiencing a temporary dropoff of demand?

The striving to find answers to these questions determined the content of the research carried out by the Laboratory for Economic Methods for the Management of Social Production of the Economics Faculty of Moscow State University imeni M. V. Lomonosov. A specially prepared questionnaire was used in questioning the managers of about 30 Academy, branch and planning institutes, small state and private enterprises carrying out scientific and technical production activity. The inquiry involved a total of more than 150 persons. The objective of the study was to ascertain the readiness (or nonreadiness) of those queried for adequate reaction to economic stimuli generated by their surroundings—the state or the market.

Economic behavior was determined in five spheres of vital activity: in everyday life, when selecting the sphere of application and level of work intensity, in concluding trade deals in the sphere of investment activity and within the framework of entrepreneurial (managerial) activity.

In each of these fields, as a point of departure taking the agreement or disagreement of the respondent with the assertions set forth in the questionnaire, a definite "economic activity" index was formulated. In a case when in importance it exceeded half the corresponding scale it was assumed that in this field the queried individual is behaving (and will behave) as an "economic entity."

What did the questionnaire results show? Among the managers of scientific research organizations 31% are inclined to economically rational decisions in the sphere of everyday activity, in the sphere of trade relations—16.5%, in the field of work behavior—4%, in investment activity—25% and in entrepreneurial (managerial) activity—34%. As a comparison, according to an inquiry which we carried out among different layers of the population a year ago, the corresponding percentages were: 38.0, 16.6, 19.4, 27.2 and 15.0%.

We note a well-expressed "noneconomic" tendency in the principles for choice in the directions of their work activities and their intensities. In other words, the questionnaire data do not contradict the everyday conviction that scientists "are not of this world." But whereas for the rank-and-file scientific worker such a characterization of him is excusable, the mentioned characterization for a scientific research organization manager is capable of giving rise to acute problems for the organization which he heads.

Some idea of in what type of NIO economic problems may be concentrated is conveyed by the table, which gives the percentages of managers who apply predominantly economic criteria when making decisions in socially significant fields of activity.

Type of NIO	Institute of Russian Academy of Sciences	Branch institute	Small scientific enterprise
Sphere of activity			
Work activity	0.0	6.5	7.7
Investment activity	14.3	38.7	46.2
Entrepreneurial and managerial activity	14.3	45.2	69.2

It is easy to confirm that an objective distribution of financial difficulties in present-day Russian science corresponds fully to that which it should be taking into account the range of thoughts of managers at different NIO.

Attention must be given to at least two other objective factors. The first is the age of the NIO managers. At Academy institutes the percentage of managers at all levels younger than 35 years was 12.5%, from 36 to 50—31.3% and older than 50—56.2%. At the branch scientific research institutes these percentages were 34.9, 55.4 and 9.7% respectively and at small NIO—94.6, 5.4 and 0%. The second factor is the percentage of budgeted funding for scientific research work. In the Russian Academy of Sciences it was greater than the percentage of contract work in 81% of the cases and less than the latter in 19% of the cases. At the branch scientific research institutes the ratio was the opposite—28 and 52%, but in 20% of the cases there was simply no budgeted funding. At small NIO budgeted funding was received in 3% of the cases (and, moreover, in an amount less than agreed upon), but in 97% of the cases there was none at all. Accordingly, the managers, as they say, have directed their very life in some cases to commercial activity, the search for advantageous orders, but in other cases to pursuit of research without respect to direct

profitability. But, after all, that is precisely as it should be! On the other hand, it would be an abnormal and unacceptable situation in which all the NIO and their managers were concerned only with profit-making development work since this would mean true death for the entire scientific body.

What conclusions can be drawn from the questionnaire? The market for scientific and technical products has now "matured" in Russia for the sphere of practical and design-construction development work. At NIO traditionally engaged in fundamental research there is virtually no "market readiness." However, the actions of authorities with respect to them do not differ too greatly from the actions taken relative to "goods-producing" NIO.

If the government is seriously interested in the development (or at least survival) of the scientific structure of the country this policy must be changed. Just how it must be changed is a matter for special consideration.

ANALYSIS, TREATMENT, MINING

Physicochemical Properties of Nickel Monoaluminide Obtained by Self-Propagating High-Temperature Synthesis and Compacting of Clad Powders*947D0053A Moscow METALLY in Russian No 3, May-Jun 94 pp 161-170*

[FBIS Abstract] The influence of the method of obtaining the initial composite Ni-Al powders (mechanical mixtures of Al and Ni, clad particles, composite particles after attrition) on the behavior of nickel monoaluminide during sintering under the conditions of self-propagating high-temperature synthesis (SVS) combined with compacting, and on the properties of compacted NiAl were studied. The advantages of using aluminum-clad nickel powder and SVS sintering were demonstrated. The resulting NiAl compacts, which exhibit high uniformity of chemical composition throughout their entire volume, are not inferior and even surpass monoaluminide obtained by fusion in heat resistance.

Seven figures, 11 bibliographic references.

METALS

Efficiency of Using a Solid Carbonizer in the Ladle Carbonization of Converter-Made Rail Steels*947D0056A Moscow STAL in Russian No 6, May 94 pp 33-36*

[Article by A. L. Nikolayev, N. A. Fomin, M. S. Gordiyenko, V. A. Buymov, V. N. Bedarev, A. P. Morokov, and A. P. Nekrasov; Siberian Metallurgical Institute, the Ukrainian Scientific Research Institute of Metallurgy, the Western Siberian Metallurgical Combine (joint stock company), and the Kuznets Metallurgical Combine (joint stock company); UDC 669.184.244.66]

[FBIS Abstract] Data from an extensive series of test batches of converter-refined steel used to make R65 rails were analyzed to determine the effect of ladle carbonization with a solid carbonizer on the quality of the metal. The steel was made by Western Siberian Metallurgy, and the rails by the Kuznets and Azovstal companies. Cable steel made by the Western Siberian was also evaluated, since the technical characteristics of this steel are helpful in clarifying questions that arise with rail steels. Each type of steel was made in a consistent manner, with the exception that the carbon content at the end of the blowing process and the degree of ladle carbonization were varied. The results of the study showed that the best results for steel and rail quality were obtained when blowing was sustained until the carbon level was low and subsequently brought to the required level by adding a solid carbonizer to the ladle. Figures 1; tables 5.

Plans Outlined for Overhaul of Aluminum Smelters*947D0062A Duesseldorf VDI NACHRICHTEN in German No 34, 26 Aug 94 p 11*

[Article: "Former Arms Plants Can Speed Up Their Conversion. Russia's Aluminum Plants Facing Renovation"]

[FBIS Translated Text] Moscow, 26 Aug 94 (VDI-N)—The French Pechiney company is presently developing master plans for the modernization of two of Russia's largest aluminum plants. The contract provides for the renovation of the plants in Krasnoyarsk and Bratsk (both in East Siberia). The Krasnoyarsk plant was designed for annual output of 750,000 tons of metal. Pechiney will develop a program for one of the three plant components (250,000 tons). The reduction of polluting emissions plus a pronounced reduction of energy consumption are the aim.

According to the Interfax agency in the middle of August, one of the Russian side's basic claims is that the majority of the required arms can be produced in the domestic plants of the armaments sector. According to the plan, their cooperation could stimulate the conversion. The project is to be financed through a loan. An additional source of financing is the foreign currency earnings of the Krasnoyarsk plant, which is among the most important exporters of the light metal in the global market. The plant currently exports more than 50 percent of its total output. According to a spokesman for the concern, the recent lowering of export duties for aluminum should hardly exert any influence on the plant's export dynamics; the situation in Russia's domestic market for this metal is what is important. In accordance with international agreements, the Krasnoyarsk aluminum plant is reducing its output by 10 percent in 1994. The partial modernization of the aluminum plant in Bratsk has the same aims as in the Krasnoyarsk project. It will presumably be implemented in accordance with these aims.

METAL, COATINGS, WELDS

Direct-Current Electric-Arc Furnaces: Present and Future*947D0055A Moscow STAL in Russian No 5, May 94 p 44*

[Article by L. M. Simonyan and G. I. Kotelnikov, Moscow Institute of Steel and Alloys; UDC 669.187.26]

[FBIS Translated Text] In February of this year, the Moscow Institute of Steel and Alloys hosted a seminar on issues relating to the design of direct-current electric-arc furnaces and their role in the production of steel and alloys. Seminar participants included colleagues from the All-Union Scientific Research Institute's Electrical Heating Equipment Company, the Central Scientific

Research Institute of Ferrous Metallurgy, the EKTA Science and Technology Corporation, the Moscow Metallurgical Institute Evening Study Program, the Institute of Metallurgy of the Russian Academy of Sciences, the Chernovtsy State Technical University, the All-Union Scientific Research Institute of Aviation Materials, the All-Union Institute of Light Alloys, and the Central Scientific Research Institute of Machine Technology. The seminar was also attended by Yu. V. Utkin, director of the main administration of ferrous metallurgy of the Committee of the Russian Federation on Metallurgy, and L. K. Kosyrev, chairman of Spetsstal.

The proceedings were opened by Professor V. A. Grigoryan, who heads the host school's department of steel electrometallurgy and ferroalloys. He spoke about the timeliness of the seminar topics and outlined the main scientific and technical considerations involved in designing reliable direct-current electric-arc furnaces and developing efficient processes for refining metals and alloys in these furnaces. He also pointed out how important the seminar was for the training of metallurgical engineers.

G. N. Okorov of the Central Scientific Research Institute of Ferrous Metallurgy gave a presentation on the background history behind the design and development of direct-current electric-arc furnaces. He highlighted the close relationship in design and function between these furnaces and plasma furnaces, noting that Russia is a world leader in the development and manufacture of the latter (footnote: see related articles in this issue). He also made a point of characterizing as very promising the organization of metallurgical enterprises that utilize direct-current arc heating in all stages of the steelmaking process.

V. S. Malinovskiy, the director of EKTA, which stands for Ecology, Technology, and Automatization, reported that the company is presently working on the design, production, and turn-key installation of direct-current electric-arc furnaces at a number of Russian plants, including the Electrosteel Heavy Machinery Company, the Kama Automotive Plant, the ZIL Automotive Plant, and the Kirov plant. Electrosteel Heavy Machinery has organized the production of a direct-current arc furnace with a capacity of up to 40 tons. According to Mr. Malinovskiy, the advantage of this company's designs is that they allow for the unique characteristics of direct current arc furnaces when formulating the energy profile for the production process, deciding upon hearth-level electrode design and placement, and so forth. The company has developed the capability to produce direct-current arc furnaces with high unit power outputs and capacities of 100 tons and more. For the time being, it is not possible to reveal how the company is able to do this.

M. M. Krutyanskiy of the Arkterm [Arc Heating] Scientific Production and Export Company, which is affiliate with the All-Union Scientific Research Institute's Electrical Heating Equipment Company defined problems

which, in his opinion, are holding back the development of direct-current arc furnaces: the design of reliable hearth-level electrodes and the development of melting practices that ensure the most efficient utilization of a furnace's rated capacity. He said that the rod-shaped hearth-level electrodes developed at the Institute and domestic power supplies allow furnaces to operate at a current intensity of up to 80 kA. The multi-tip and plate hearth-level electrodes used by western steelmakers operate at current intensities of up to 100 to 140 kA, although their durability (up to 700 heats) is much lower than that of rod-shaped electrodes (two to three years) given the same current intensity. Computer modelling of the refining process in a direct-current arc furnace has made it possible to develop more efficient energy consumption profiles and to increase the power supply utilization coefficient twofold.

A. Ya. Stomakhin of the Moscow Institute of Steel and Alloys addressed the technical problems associated with steelmaking in direct-current arc furnaces, one of the most important of which has to do with the addition of nitrogen and alloying elements. Analysis of the results of industrial heats of high-speed and machine steels attests to a reduction in the total heat loss of the metal charge, especially when remelting alloy scrap without oxidation. However, in this case, complications arise with the subsequent decarburization of the melt, the oxidation period is prolonged, weak gas evolution is observed, and the degassing effects of carbon monoxide are greatly reduced. As a result, the concentration of nitrogen in the metal can increase. It was shown that intensifying the oxidation process from the moment melt-down begins and using foaming slags helps prevent excess nitrogen from getting into the melt, activates the boiling process, and thus ensures the attainment of a nitrogen concentration in machine steels that is the norm for arc-furnace steelmaking.

During the course of the seminar, several important issues were raised that require further study. Complete agreement was not reached on the immediate necessity of increasing the capacity of direct-current arc furnaces to over 100 tons (V. G. Dyubananov and N. L. Smirnov). Many of the participants were of the opinion that technical issues related to direct-current arc furnace steelmaking have not been studied thoroughly enough, and problems remain with controlling nitrogen and phosphorous concentrations (S. A. Yoikovskiy and G. N. Utochkin). Similar concerns were raised by V. S. Malinovskiy regarding the supposed absence of toxic substances such as nitrogen oxide and cyanide in waste gasses. Despite a number of successful working designs for hearth-level electrodes, studies in this area cannot be considered conclusive, and it is necessary to find simpler, less expensive, and more reliable ways to supply positive voltage to the furnace melt. This is especially important for large furnaces with capacities of 100 tons or more.

Several times during the course of the seminar, questions were raised regarding financing for scientific research

and design projects relating to the integration of direct-current furnaces into metallurgical and machinery production processes. A. R. Kamalov, V. S. Malinovskiy, V.

D Smolyarenko, G. N. Okorokov, and others suggested that it would be a good idea to concentrate on obtaining financing from the government as well as other sources.

Neural Net Information Processing Device for an Adaptive Optical System

947G0049 Moscow IZVESTIYA AKADEMII NAUK
SERIYA FIZICHESKAYA in Russian No 6, Jun 94
pp 138-144

[Article by A. B. Utkin, Lazernaya Fizika Scientific Research Institute of the All-Russian Science Center, Vavilov State Optical Institute; UDC 5 35.8]

[FBIS Abstract] A linear adaptive optical system based on phase conjugation corrects the distortion of a plane wave front by changing the optical characteristics of the active element. Measurements are taken with a special sensor at various points in the cross section of the light beam. Problems encountered in wave front adjustment are described. Neural nets may be used as information processing devices to control adjustment of the active element. The type of neuron response and the number of layers needed to process the measurements is determined. The use of neurons with a continuous response function makes it possible to simplify the data processing system to a two-layer unidirectional neural net working in heteroassociation mode.

General aspects of implementing neural net algorithms in real systems are discussed. Potential sources of error are enumerated. Figures 2; references 18: 7 Russian, 11 Western.

Russia Seen as Major Source of Computer Viruses

947G0048 Moscow SEGODNYA in Russian 25 Aug 94
p9

[Article by Vlad Ignatov]

[FBIS Translated Text] It seems that Russian programmers will soon take first place in the world in the development and introduction of virus programs. The statistics of the All-Russian Scientific Research Institute of Problems in Computing Equipment and Informatization are telling: today two-thirds of all domestic "users," that is, users of personal computers, have encountered these creations of an antagonistic mind. A total of 85% of the viruses circulating among the computers of this country may have a "Made in Russia" label on them. And it is likely that our viruses have spread far and wide around the planet. In any case, if one believes the journal Computerwoche, Microsoft has prepared its latest version of Anti-Virus with a priority on battling viruses of Russian origin.

On the one hand, all of this warms the patriotic hearts of our countrymen, but on the other, it violates their very computers and wracks their nerves. That is why virus phobia, that is, dread of viruses, is so rampant among Russian users: viruses are blamed for all computer malfunctions. This in turn provokes extremely radical measures when a virus is revealed. The master of Russian software, Viktor Figurnov, in his book "The IBM PC for the User" (in its fifth edition) tells of the boss at

some firm who ordered reformatting of the hard disks of some fifty computers only because of a message from the Aidstest program (the old version 1.0) that there was something like a virus in the operating memory. The formatting resulted in the loss of hundreds of man-days of work and of a multitude of important documents. Later, it was found that there was no virus at all, and Aidstest had incorrectly reacted to an unknown Russian version of Microsoft Word.

Meanwhile, a cavalier attitude toward the warnings of detector programs on the possible presence of a virus in the computer appears to be very risky, especially for Russian users. Unfortunately, it is very simple to create a virus. It is sufficient to know Assembler, which is used, as a rule, to write viruses, and to know rudimentary programming. Thus, many students in Russian institutes of higher learning probably commit the sin of producing them. And not always with destructive intent.

One student at Moscow State University worked on a virus program that, when his friend booted his computer on his birthday, would display a disrobed geisha while playing "Happy Birthday to You". The intent of the virus of another woeful programmer would replace the DOS introduction line with a maternal lecture. But because both virus authors were insufficiently educated, instead of a frivolous surprise, the friend of the former virus writer received a cruel non-stop invisible rewriting virus. The latter's program turned out to be a destructive loader virus.

In general, as is acknowledged by many programmers specializing in antivirus "first aid," most of the computer "infections" circulating in the country's computers were created by very illiterate programmers, which means it is difficult to uncover and cure them with antivirus programs. As a user, the author of this article has seen a case where a virus that had infected the operating system loader could not be neutralized by Anti-Virus. The program simply could not recognize it because the virus was developed in Russia, and was very clumsy.

Unfortunately, most anti-virus programs can recognize and cure only a certain fixed set of viruses. For example, the Scan program by McAfee Associates, and Aidstest by Moscow resident Dmitriy Lozinskiy can detect almost 600 viruses; however, today there are more than 3000 known viruses. Norton Anti-Virus is not bad; it can adjust to new types of viruses. The domestic analog, AVSP, which was developed at Moscow State University, has the same capabilities. One hundred percent protection has not been created.

In order to save the information on a disk from destruction by viruses, Viktor Figurnov advises that one first prepare a system disk with the DOS version that is being

used (including the processor file COMMAND.COM) and a "repair kit" of programs to manage disks and a file system, to establish the configuration of the computer and to unpack archives. The author of "The IBM PC for

the User" also insistently recommends that one not let anyone boot just any game on your computer, and not get carried away yourself, because frequently the cause of virus infection is booting games on a diskette.

Acoustic Interferometry in the Ocean

947K0112A Vladivostok AKUSTICHESKAYA
INTERFEROMETRIYA V OKEANE in Russian
Jan 93 pp 2, 3, 146-151

[Article by Ye. F. Orlov, G. A. Sharonov, RAS Far-East
Branch, Pacific Ocean Oceanographic Institute; UDC
534.6:551.46]

[FBIS Abstracts]

Annotation

Methods for studying fine effects of interference, generated by propagation of low-frequency sound in the ocean, are examined in this collection. These are the methods of local (intermodal) and spatial interferometry. It is demonstrated that a new high efficiency technology is employed for acoustical measurements involving acoustic interferometers with independent recording using self-contained bottom stations. Results are described of in situ ocean measurements, which made it possible to obtain data on interference modulation and spatial correlation of broadband signals in different types of ocean waveguides. Original methods for experimental study of the waveguides dispersive characteristic are examined. This collection reflects the state of the art of studies in the field of acoustic interferometry, opening new horizons for acoustic diagnostics of the ocean. The collection is intended for scientists and engineers, specialists in the area of oceanography, seismoacoustics, and hydroacoustics, for graduate students and students of pertinent specialties in the institutions of higher learning, and also for a broad range of readers interested in problems of the World Ocean.

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Foreword

The acoustic interferometry as a field of acoustic measurements in the ocean emerged because of the necessity of employing low-frequency acoustic waves for solving the problems of ocean diagnostics. The low-frequency sound in the ocean propagates long distances, and because of this property it can be effectively employed for studying ("illuminating") large scale heterogeneities of water medium and the ocean bottom. However, technical difficulties in designing the devices measuring the spatial structure parameters of low-frequency acoustic fields in the ocean significantly retard the development of the acoustic diagnostics methods of large scale formations in the ocean. The problem is that in order to measure useful information-carrying phase-front variations of the acoustic waves "illuminating" the ocean heterogeneities, a multi-element recording systems must

be constructed with sensors, separated in space by large distances (up to hundreds kilometers and more).

This collection deals with a search of new ways for development of the longwave acoustic diagnostics of the ocean. The idea of developing complex and continuously operating stationary sensing systems must be abandoned. An acoustic interferometry method with an independent reception is proposed and is developed here. This method is familiar in radio-astronomy as an efficient method for constructing radio-interferometers with a super-large base (with dimensions up to the Earth radius), when no means are available for combining the signals of the interferometer arms at a single point for signal processing. The essence of the method is that during the experiment, the signals are received independently by the interferometer elements (arms) and are registered at the point of reception simultaneously with uniform accurate time signals. In this case, the feasibility of a consequent combined coherent signal processing of the interferometer arms is retained.

The material of this collection contain a description of the interferometer method with independent reception applicable to acoustic measurements in the ocean. An equipment complex is described, which was developed using independent data from hydroacoustic receiving stations. Great attention is devoted to experimental studies of spatial coherence of acoustic fields in different regions of the World Ocean. Results of studies on frequency relationship of the spatial correlation of the medium transfer function, obtained by the authors in regions with different conditions of sound propagation are doubtless of interest. Novel and interesting is also the frequency analysis method of transient processes, which is discussed in these articles. With this method, the dispersion characteristics of the ocean waveguides can be experimentally obtained with high accuracy. This collection reflects the contemporary research level in the area of acoustic interferometry, which opens new possibilities for the ocean diagnostic by acoustic methods.

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Interferometry Methods in the Ocean Acoustics

[Orlov Ye. F. Vladivostok: Dalnauka, 1993, pp 4-17. UDC 534.6:551.463]

Interferometry features in the ocean acoustics are examined. Methods of local (superposition of oscillations at the point of reception) and spatial (superposition of combined acoustic oscillations received at spatially separated points of reception) interferometry are described. Feasibility of realizing interferometry methods in hydroacoustics by developing and employing interferometers with independent reception is pointed out. Figure 1, references 9.

Multichannel Interferometer With Independent Reception for Acoustic Studies in the Ocean

[Belavin Yu. S., Volnitsyn V. A., Orlov Ye. F.; et al. Vladivostok: Dalnauka, 1993, pp 17-32. UDC 534.6:551.463]

An acoustic interferometer with independent reception for ocean studies using self-contained bottom stations and a uniform accurate time system is described. Application of a multichannel interferometer with independent reception offers a feasibility for conducting synchronous measurements in the range of low acoustic frequencies with practically unlimited base distances. Instrument system for reception, radiation, recording, collection and processing of signals, including navigation and hydrophysical data on the experimental conditions is described. Interferometer signal processing can be realized using a developed package of programs, which takes into account the parameters of the reception systems installation and the geometry of the radiators relative motion. Calibration problems of the multichannel interferometer reception channels with a uniform accurate time system and the computer signal processing are examined. Figures 5, references 5.

Experimental Studies of Spatial and Local Interference of Wideband Signals in Hydroacoustic Waveguides

[Lobanov V. N., Nefedov L. M., Orlov Ye. F.; et al. Vladivostok: Dalnauka, 1993, pp 33-70. UDC 535.6:551.463.256]

Experimental results on spatial correlation of signals from pulsed seismoacoustic pneumatic sources in different hydroacoustic waveguides, obtained with an independent reception interferometer are provided. Self-contained bottom stations with accurate time clocks were employed. Data is obtained on the level and form of low frequency acoustic fields spatial correlation in a uniform shallow waveguide (using an interferometer with a 1,000 m base), in a near-bottom waveguide at middle and large depths (9 and 45 km base), in a nonuniform waveguide at the drop-off (3.5 km base). The local interference studies demonstrated the existence of coherence in beams of different cycles of bottom and surface reflections in the near-bottom waveguides at middle and large depths. Figures 26, references 4.

Experimental Studies of Spatial-Frequency Relationship of Transfer Functions of Hydroacoustic Waveguides

[Andrianova T. A., Koptev M. I., Lebedev Yu. P.; et al. Vladivostok: Dalnauka, 1993, pp 70-105. UDC 534.6:551.463.256]

Methods are described of employing an acoustic interferometer with independent recording jointly with a pulsed sensing system for experimental study of the fundamental characteristics of the wideband acoustic fields spatial structure in the ocean waveguides. Results are provided of studies on the frequency relationship of spatial correlation of the medium transfer function in shallow and deep regions with an interferometer whose base was up to 90 km, on the mode composition and sound dispersion in shallow water. A comparison is made between the obtained and computed data for a shallow sea. A good agreement of spatial correlation, as well as dispersion characteristics of the acoustic field was demonstrated. Figures 19, references 2.

Space-Frequency Relationship of Interference Modulation Parameters of Wideband Sound in a Near-Surface Channel

[Golubev V. N., Fokin V. N., Sharonov G. A. Vladivostok: Dalnauka, 1993, pp 105-116. UDC 534.6:551.463]

Experimentally obtained parameters of interference modulation are compared with computation results in the near-surface channel based on the beam theory. It is demonstrated, that the detailed structure of the sound velocity relationship as a function of depth affects only the spatial scale of the ordered two-dimensional structures, responsible for distribution of the wideband noise intensity on the range-frequency plane. Relationship between the coordinates of interference modulation parameters as a function of the points of radiation and reception is examined, and the results of measurements are compared with the computation data. A feasibility for predicting the interference modulation parameters based on simple analytical models is demonstrated. Figures 4, references 7.

Determination of Parameters of the Agitated Surface

[Lazarev V. A., Lobanov V. N., Sokolov A. D. Vladivostok: Dalnauka, 1993. pp 117- 126. UDC 551:463. 21.231.2]

Effect of the wind produced agitation of sea surface on the interference nodulation of a wideband sound is experimentally examined. A method for measuring the agitation spectrum, which would expand the measurement range of the agitated surface variations (rises) into the longwave region is proposed. Results of in situ measurements in a deep water region of the agitation frequency-spectrum in the (0.02-0.5) Hz frequency range, which corresponds to the (2x102 - 5x103) m wavelength range are provided. Figures 3, references 17.

The Method of Frequency-Time Analysis of High Resolution Pulses in the Study of Dispersion Characteristics of the Ocean Waveguides

[Lebedev, Yu. P., Orlov Ye. F., Saltykov A. A. Vladivostok: Dalnauka, 1993, pp 126-139. UDC 534.6:551.463]

Feasibility is examined of measuring the mode composition and sound dispersion in ocean waveguides by a spectral-time analysis of the waveguide response to a pulsed excitation applying a signal transformation algorithm with a high frequency-time resolution (Wigner-Vilia transform). The capacity of the examined method is demonstrated by example of measuring the dispersion and mode composition of the sound in a uniform hydroacoustic waveguide in shallow water. Figures 4, references 20.

Noise Immunity of a Hydroacoustic Interferometer With Signal Separation From a Wideband Source

[Matveyev A. L. Vladivostok: Dalnauka, 1993, pp 139-145. UDC 534.6:551.463]

Ultimate capacities of a hydroacoustic interferometer for discrimination of weak wideband signals from local sources in the background of normal isotropic noise are examined. Equations are obtained and graphs are provided which allow, based on the specified probabilities of false alarm, correct detection and known processing parameters, to determine the threshold signal-to-noise ratio at the interferometer reception points, where the signal discrimination from a weak source in the background of noise in the mutual correlation function (MCF) of signals from hydrophones, is still possible; and also to select the threshold at the output of the processing channel for interpretation of the MCF maxima. Corrections to the operating characteristics for a single energy receiver are provided. Figures 4, references 3.

Information About Authors

Ye. F. Orlov; Pacific Ocean Oceanologic Institute FED RAS, Vladivostok

G. A. Sharonov, L. I. Tatarinov, V. A. Volnitsin, V. N. Lobanov, A. A. Saltykov, T. A. Andrianova, A. L.

Matveyev, V. A. Lazarev, V. N. Golubev, V. N. Fokin; Institute of Applied Physics RAS, Nizhniy Novgorod

Yu. S. Balavin, L. M. Nefedov, V. V. Perunov, M. I. Koptev; Special Design Bureau of Automation Facilities of Sea Studies FED RAS, Yuzhno-Sakhalinsk

Yu. P. Lebedev; State University, Nizhniy Novgorod

Study of the Effect of Nonlinear Scattering of Radio Waves by Metallic Objects

947K0111A Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 39 No 6, Jun 94 (manuscript received 10 Dec 93) pp 902-906

[Article by V.B. Shteynshleyger and G.S. Mizezhnikov; UDC 621.371.332.4]

[FBIS Abstract] The effect of nonlinear scattering of radio waves by metallic objects consists of the appearance of scattered radio waves at harmonics and combination frequencies not present in the wave irradiating the object. This effect has been demonstrated to result from the nonlinear voltage-current characteristic of the contacts of the object's oxidized metallic parts. Most published experiments examining nonlinear scattering were conducted with a nonlinear vibrator (a half-wave symmetric vibrator with a contact of two specially prepared small oxidized steel components included at its center). In the study reported herein, the nonlinear effective scattering area (σ_n) of a number of common metallic objects was determined along with the dependence of σ_n on the power flow of the irradiation. σ_n was determined from the relationship $\sigma_n = 4\pi r^2 F_{ass}/F$, where F_{ass} is the power flow scattered by the object at the frequency of the harmonic assumed at a distance of r from the object and F is the power flow irradiating the object at the frequency of the first harmonic f_0 . A type SMV-8 field-strength meter was used to measure F and F_{ass} . Most of the experiments conducted involved irradiation at one frequency in the wavelength range $\lambda_0 \approx 1$ m. In the experiments involving two frequencies, f_{01} and f_{02} were also in the $\lambda \approx 1$ m range of wavelengths. Continuous vibrations with vertical wave polarization were used in the experiments, and the distance between transmitter and receiver was generally selected so as to satisfy Fraunhofer region criteria. The experiments were designed to ensure the required attenuation of the earth's effect on the measurements of a nonlinear effective scattering area, the oscillator provided the required high degree of harmonic filtration, and the antennas were designed so as to attenuate the parasitic appearance of a harmonic as a result of nonlinear effects at the contacts of each antenna's structural elements. The following were among the common objects whose nonlinear effective scattering area was measured: van trailer, motor truck, crawler tractor, Zhiguli vehicle. The sensitivity of the measuring unit corresponding to a minimum measurable nonlinear effective scattering area of $\sigma_n = 10^{-9}$ m² (-90 dB/m²). The intensities of the effect of nonlinear scattering at the third harmonic and at a third-order

combination frequency were similar to one another and much (about 25 dB higher given an irradiation flow of $0.2-1 \text{ W/m}^2$) higher than at the second harmonic or second-order combination frequency. This finding was taken as confirmation of the fact that the voltage-current characteristic of the contacts in real metallic objects is close to the cubic dependence studied on specially prepared contacts and reported in other publications. For that reason, all of the ensuing measurements were made at the third harmonic. For most of the objects studied, σ_n ranged from 10^{-5} to 10^{-8} m^2 . σ_n was found to be a random quantity that depends on the mechanical forces acting on the object, small deformations in the vicinity of the contacts, the object's position and condition, and other factors. In most cases, the dependence of σ_n on F when $F < 1 \text{ W/m}^2$ in a logarithmic scale was found to have the form of sloping straight lines. The dependence was therefore approximated in the form of the power function $\sigma_n = \sigma_{n0}(F/F_0)^{m-1}$, where F_0 is the normalizing power flow ($F_0 \geq F$) at which $\sigma_n = \sigma_{n0}$. The objects' vibrations were found to have a significant effect on their nonlinear scattering of radio waves. Figures 3; references 4 (Russian).

Estimating the Directional Vectors of an Object's Motion Based on Goniometric Systems

947K0111B Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 39 No 6, Jun 94 (manuscript received 9 Nov 92) pp 923-929

[Article by Yu.G. Bulychev; UDC 621.396.96]

[FBIS Abstract] A new method has been developed for determining the complete set of directional vectors of the curvilinear motion on an object in space based on the results of high-precision measurements of the said object's angular coordinates as determined by a fixed direction finder. In essence, implementation of the new method requires the solution of two systems of algebraic equations and the weighted summing of sets of single estimates. A sample calculation performed to evaluate the new method's operability confirmed that estimates obtained for conditions similar to those under which actual high-precision goniometric systems operate are consistent with estimates obtained by using classical optimal estimation methods (especially methods based on the Markovian theory of linear and nonlinear filtration). Another benefit of the proposed method is that it does not require use of the complex iteration procedures that are inherent to conventional estimation methods based on high-precision goniometric systems and therefore does not require the large amounts of computer time and resources that are required by the classical estimation methods. Figures 2; references 15 (Russian).

Using Modulation in Microwave Generators To Produce a Stochastic Output Signal

947K0111C Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 39 No 6, Jun 94 (manuscript received 6 Jan 93) pp 957-962

[Article by V.L. Vaks, N.S. Ginzburg, A.S. Sergeyev, A.S. Smorgonskiy, V.V. Khodos, and A.O. Shuleshov; UDC 621.373.1.01]

[FBIS Abstract] A study examined the possibility of designing a microwave-range noise generator by modulation of the electron beam with comparatively low frequency (with respect to the carrier frequency) harmonic and noise signals. The study focuses on stochasticization of the oscillations of microwave generators of the backward-wave [BW] tube type with additional modulation of their electron beam by various types of signals. First, modulation was achieved by the simultaneous use of regular and noise signals. It was decided to use a periodic signal with a triangular form because such signals result in noise with the most even spectral characteristics. The mean square voltage of the low-frequency noise signal was $\approx 1 \text{ V}$, the working frequency of the BW tube-type noise generator ranged from 117 to 178 GHz, and generator's integral output power equaled at least 5 MW. The noise's bandwidth was controlled by using a potentiometer in the range from 5 to 100 percent of the maximum value. A DAZ.36 Fourier spectrometer (BOML M, Canada) was used to measure the noise's spectral characteristics. The maximum noise frequency band amounted to about 18 GHz, and the variation in the frequency response in the noise band reached 10 dB (mainly because of distortions in the shape of the sawtoothed signal and the inherent variation in the amplitude-frequency characteristic of the BW tube). A series of calculations were performed to verify the possibility of stochasticization of the BW tube's output radiation by modulating the electron beam with a regular (but not necessarily monochromatic or periodic) signal. As demonstrated elsewhere, the following different generation modes were implemented in a BW tube without additional modulation depending on the current length and magnitude as characterized by the generalizing parameter L : a single-frequency mode at $1.97 < L < 2.9$; a self-modulation mode when $2.9 < L < 5.5$; and a stochastic mode when $L > 5.5$. First, the effect of modulation of detuning on the output radiation while the BW tube operated in a single-mode generation mode ($L = 2.7$) was studied. At low modulation depths ($\alpha_i < 0.1$ to 0.3), the output signal acquired the characteristic features of amplitude modulation, and the corresponding side frequencies appeared in its spectrum. As the modulation depth was increased, the spectrum expanded gently. When $\alpha_i > 1.5$, however, the signal's amplitude dropped sharply. This behavior was interpreted as an interruption in generation that in turn made the said generation mode little interesting from a practical standpoint. Further calculations were performed with values of L that in the absence of additional modulation, resulted in a mode of self-modulation oscillations. When L was less than or approximately 3.0, it was not possible to achieve stochasticization of the oscillations. Qualitative changes in the output signal's spectrum were only observed in cases where $L \geq 3.5$ and the values of α_i were close to 1. The presence of continuous bands in the spectrum corresponded to the appearance in the signal itself of segments of stochastic behavior. As L increased, the duration of the said segments increased and the spectrum became less and less irregular. The

region where $L \geq 4.0$ was considered the boundary of continuous stochastization when rather strong modulation ($\alpha, \approx 1$) was introduced. Introducing additional modulation in the model studied was thus shown to reduce the stochastization threshold with respect to L by approximately 30 percent. Figures 5; references 14 (Russian).

Dynamics of Switching a Goto Pair of Josephson Tunnel Junctions

947K0108A Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian No 5, May 94 (manuscript received 22 Dec 92) pp 869-875

[Article by I.N. Askerzade and V.K. Kornev; UDC 537.312.62:621.3.029.6]

[FBIS Abstract] A study examined the possibility of creating a fast highly sensitive comparator based on a Goto pair of Josephson tunnel junctions. The balanced comparator's circuit consisted of a pair of identical Josephson junctions (shunted by a resistor) through which the circuit was connected to a gate signal source in the form of a voltage pulse; a current representing the sum of the currents of the study signal and the feedback circuit signal; a voltage whose average value was the comparator's output signal; and a comparator feed current. In all currently existing gating converters based on Josephson tunnel junctions, alternating feed and an external timing oscillator are used. In the present study, a direct feed current and internal timing oscillator were used. The timing oscillator was a relaxation oscillator based on a Josephson junction. Two extreme cases of connecting the comparator and gating voltage pulse were

considered: the case of an "inductive" connection and the case of a "resistive" connection. Circuits with alternating and direct feed currents were considered. Processes were developed for switching Goto pairs of Josephson tunnel junctions to a resistive state given different rates of rise of the gating current signal. The voltage-current characteristics of such a Goto pair used as a balancing pulse comparator in gate conversion circuits with direct and alternating feed currents have been calculated. In essence, the studies conducted demonstrated the fundamental impossibility of obtaining high time resolution when using Josephson tunnel junctions with hysteretic voltage-current characteristics in a balanced comparator. The explanation for the impossibility of creating a high-speed, high-sensitivity balanced pulse comparator based on a Goto pair of Josephson junctions was said to be the inertia of the tunnel junctions themselves. When Josephson phases rise rapidly at the moment of the arrival of the gating current pulse, this inertia renders such systems "crude" (i.e., little sensitive to the magnitude of the input signal at such times) and incapable of functioning as a pulsed current comparator. The studies further indicated that only at very low rates of gating current rise where $\alpha\beta \leq \delta i$ (where δi is the fluctuation "blurring" of the comparator's threshold characteristic) will the sensitivity of such a comparator approximate the order of magnitude of the fundamental threshold. In such cases, however, the time resolution will be low (on the order of several nanoseconds). It was concluded that researchers attempting to design comparators based on Josephson tunnel junctions should either abandon the balancing principle and use unbalanced circuits based on tunnel junctions or else use balanced comparators based on anhysteretic Josephson junctions. Figures 4; references 10: 2 Russian, 8 Western.

AVIATION AND SPACE TECHNOLOGY

Prospects for the Development of a Raw Material Base of Beryllium Ores in Russia

947F0203 Moscow RAZVEDKA I OKHRANA NEDR
in Russian No 3, Mar 94 pp 13-14

[Article by I. I. Kupriyanov a, M. I. Noikova, Ye. P. Shpanov, All-Union Scientific Research Institute of Mineral Resources]

[FBIS Translated Text] Beryllium is a rare element with unique properties, which makes it irreplaceable in metals, alloys, ceramics and composite materials used in nuclear science, the aerospace industry, and other areas of technology. By foreign expert estimates, the increase in world demand for beryllium in the 1990s will jump from 5-7% to 8-10%. During 1960-1980, due to the efforts of scientific research institutes (the All-Union Scientific Research Institute of Mineral Resources, the Institute of Mineralogy, Geochemistry, and Crystallochemistry of Rare Elements, and others) and territorial production organizations of the Ministry of Geology, the USSR created a mineral raw material base which fully met industry's need for beryllium. The raw material base depended mainly on the Yermakov deposit, which has rich ores, and other deposits of new industrial types. After the breakup of the USSR the situation with the production of beryllium products and provision of beryllium as a raw material changed fundamentally in Russia.

The production of commercial beryllium products at the Ulbinsk factory in Ust-Kamenogorsk (Kazakhstan) now occurs outside Russian borders. The factory operates with a heavy load, selling its products at world prices in Russia, Europe, and Japan. It is significant that more than half of the industrial resources of the Yermakov deposit have been depleted, and are now stored at the Ulbinsk factory in the form of concentrate, which will insure its operation for the next 25 years.

One would expect that after the economic situation stabilizes in Russia, and after highly technological production is strengthened, the demand of industry for beryllium will increase sharply. The issue of the creation of domestic beryllium production and the provision of high-quality ores is being discussed. Of the former sources of raw materials, the Belogorsk mining and enrichment plant is now in Kazakhstan, and the production of concentrates at the Malyshev and Zavitin deposits has ceased because they are nearly exhausted.

The most promising beryllium province remains Buryatia, where beryllium formed practically significant concentrations in various periods of the region's geological development in the post-Proterozoic. However, the largest deposits were formed in the Mesozoic tectonic-magmatic activation, which caused the generation of a series of depressions, which are located in the Western Transbaikalian Caledonian fold system. At the edges of the depressions fracture hypabyssal intrusions and volcanic

systems are frequently formed which are comprised of subalkaline granitoids (granites, granosyenites, quartz syenites). Beryllium, fluorite, lead-zinc, gold ore, rare earth and uranium-molybdenum mineralization is associated with these volcanic-plutonic complexes. The most promising zones of Mesozoic tectonic-magmatic activation are the Kizhingino-Kudun, Turkino-Bambuy, and Tashir zones.

The Kizhingino-Kudun zone is in the central part of Buryatia and includes the Yermakov and Orot deposits, as well as a series of ore manifestations. The Yermakov deposit, which has been used, is a bertrandite-phenacite formation with rich ores, 1.2% BeO. It has been fully surveyed and there should be no additional resources.

A distance of 30 km to the northeast of this site is the Orot deposit, a bertrandite formation which has undergone preliminary surveying (0.44% BeO). It is confined to a ring-shaped volcanic-plutonic structure with funnel, effusive, and hypabyssal facies. The ore bodies are found among the latter and are composed of quartz-dickite argillizites with bertrandite impregnation. The argillizites contain to some extent relic potassic feldspar, albite, quartz, and zircon. The presence of the latter indicates the complex zirconium-beryllium content of the ore. It is favorable that the ores have been enriched according to a scheme similar to that of the Yermakov ores. An unfavorable factor is the complex morphology of the ore bodies.

The Turkino-Bambuy zone is in northern Buryatia, and has prospects comparable to those of the Kizhingino-Kudun zone. It is primarily associated with the Aunik deposit, which is a bertrandite-phenacite formation. Preliminary surveys revealed poor ores at the Aunik deposit (0.184% BeO), but it is possible to recalculate for richer ores (0.42-0.49% BeO) by increasing the edge content, and naturally, with losses of part of the resources. The bertrandite ores dominate over the phenacite ores. The presence of TR, Th, and Zr is characteristic in monazite, bastnasite, thorite, ferrithorite, and zircon. Apocarbonate metasomatic cores form lens-shaped and more complex bodies in the superintrusion portion of the massif of subalkaline granitoids, which breach Proterozoic limestones interbedded with schists.

In western Buryatia, the Tashir zone includes beryllium and fluorite ore in commercial quantities which are closely associated. The ore field is within the Ubur-Tashir granite-granosyenite massif, which is Triassic in origin, and breaches the Paleozoic granites and Proterozoic effusions to the edge of the Borgoy superimposed depression. The massif intersects the Urmin beryllium deposit, the Ubur-Tashir ore manifestation and the Naran fluorite deposit. The beryllium ore is in a phenacite-genthelvite formation of feldspar metasomatites. The BeO content is 0.3-0.44%. The ore bodies are vein shaped with a complex structure, forming lenses in strike and dip angle. They are confined to zones with

fractures in a different direction. The ore contains, in addition to potassic feldspar and albite, a great deal of quartz; hematite is characteristic. The beryllium is concentrated in bertrandite, and to a lesser extent in gelvite, which gravitates to lower levels of the ore bodies and is replaced by bertrandite. Several ore manifestations and geochemical envelopes of beryllium are known in the Tashir zone, and the known objects do not exhaust the prospects for this site.

There are some prerequisites for predicting the presence of promising types of beryllium ore in the Northern Baikal region, in the Rel-Kunerma-Abchad rare metal zone. It is confined to a crumple zone with a submeridional direction which is part of a system of deep fractures of the edge seam of the Siberian Platform and the Baikal fold region. The zone contains well developed multiphase, well-differentiated Proterozoic and Paleozoic granitoid complexes which are distinguished by their enhanced alkalinity and enrichment with a number of ore elements (Be, Pb, F, Nb, Ta, Sn, TR). The granitoid massifs are introduced into Proterozoic sedimentary-metamorphic layers, among which one encounters members of aluminosilicate-carbonate rock. Among the metamorphic and igneous rock is a large number of beryllium ore manifestations, with a variety of genetic types. In addition to unpromising manifestations (pegmatite, quartz-feldspar and quartz-amazonite veins with beryllium) one finds ore manifestations of promising formations: feldspar metasomatites, greisens, phenacite-bertrandite and bertrandite formations. Favorable geological preconditions and direct discovery of beryllium ore, in addition to many lithogeochemical envelopes, make it possible to optimistically estimate the potential beryllium content of the Rel-Kunerma-Abchad rare metal zone.

In the Far East in Primordkikrai the potential reserve of beryllium ore is associated with complex deposits in beryllium-fluorite formations concentrated in the Voznesen ore region. The BeO content of the ores is low (0.07-0.24%), but extraction of beryllium as a by-product may be profitable.

The ore region is at the southeast edge of the Khankay medial massif and is associated with late Baikal fold structures near the articulation with the Mesozoic fold region of Sikhote-Alinya. The deposits are located in an area above domes of small granite massifs of Silurian-Devonian origin. Their formation is associated with tectonic-magmatic activation of the Khankay massif. The granites have increased alkalinity of the lithium-fluorine geochemical type. The ore beds are composed of micaceous-fluorite apocarbonate greisens and also include enhanced concentrations of Li, Rb, and Cs.

For more than 30 years the flotation factory has extracted only fluorite from the ore, and the by-products were stored. Until recently, the Voznesen deposit produced ore with a BeO content of 0.11-0.07%. Presently, preparations are being made to work the Pogranichnoye deposit, with a higher BeO content (0.24%).

The All-Union Scientific Research and Design Institute of the Aluminum, Magnesium, and Electrode Industry (A. M. Shevyakov) and the All-Union Scientific Research Institute of Minerals (Z. A. Zhurkova) have jointly developed an autoclave method of processing the by-products of flotation enrichment of ore of the Voznesen deposit with phenacite and ore of the Pogranichnoye deposit with krisyberyllium by leaching with aluminate solutions with extraction of commercial beryllium, lithium, and rubidium, as well as fluorine in the form of cryolite. The extraction of useful components varies from 70 to 98%. The remaining by-product is profitably converted into construction materials. Thus, it is possible in principle to use the by-products of enrichment at the Yaroslav mining and enrichment factory, although there are difficulties with disposal of the excess amount of rubidium. The use of the by-products is not only economical, but also ecologically sound, because by-product storage is a source of environmental pollution.

There are some prospects for increasing the raw material base of beryllium in the Ulkan ore region at the branches of the Dzhug-Dzhur. This region has many beryllium ore manifestations in feldspar metasomatites (phenacite-genthelvite formations) with a BeO content of 0.1-0.8%.

The region is in the North-Uchur granite massive, which is comprised of rapakivi-like and riebeckite granites, to the southern edge of the Ulkan aulacogen, which arose as a result of activation of the eastern edges of the Aldanskiy plate in the late Proterozoic. Beryllium ore is represented by bertrandite, phenacite, and genthelvite. The region has widespread tantalum-niobium, uranium, zirconium, and tin mineralization. Weak erosive shearing of the granite pluton increases the promise of the ore region, which has only been surveyed along routes using trenches.

Among the promising beryllium bearing provinces are Sayany; however, known deposits are in poorly accessible mountainous regions. Thus, using them is problematic. Beryllium ore (the Kazyr and Snezhnoye deposits and beryllium-fluorite ore (Raduga) formations are associated with Devonian granites of the Buyedzhul (Ognit) complex and ore in a bertrandite-phenacite formation (the Okunev deposit) associated with the alkaline granitoid Okunev (Khaylomin) complex.

The Kazyr deposit (in the central part of Eastern Sayan) is at the southeast exocontact of the large Poselen massif of biotite and leucocratic granites of the early Devonian. These granites are breached by metamorphic carbonate-effusive-terrigenous layers of lower Cambrian and lower Paleozoic basites. The massif is at the juncture of early caledonites of the Kizir-Kazyr synclinorium and the baikalites of the Eastern Sayan anticlinorium. The ore deposit is massive and brecciated with quartz-muscovite greisens and beryl-quartz veins with fluorite, wolframite, and sulfides. The average BeO content is 0.38%.

The Snezhnoye deposit of phenacite-beryl mineralization is at the point of separation of the Khoyto-Oka and

Dokot rivers and is confined to a block of intensively tectonically worked granitoids of the Oknitsk complex, lower Paleozoic gabbroids, and crystalline schists of the Precambrian. The beryllium mineralization is localized in the breccia zone in the exocontact of the stock of subalkaline granitoids. The beryl-phenacite ores are rich (0.9% BeO).

The Raduga deposit is characterized by phenacite-fluorite mineralization (average BeO content 0.18%). It is 60 km west of the Kazyr deposit and is confined to the articulation zone of early caledonites Kizir-Kazyr synclinorium and hercynides of the Amylo-Kandat depression. The micaceous-fluorite massive and streaky greisens are developed among dolomites. In addition to phenacite there is beryl, euclase, scheelite, and lithium micas.

The Okunev deposit is a leucophane-fluorite type of bertrandite-phenacite formation. The ores contain 0.3% BeO. The deposit is within the Kizir-Kadyr metallogenic zone, is confined to the Okunev tectonic zone, and is located in the contact zone of the small fractured Okunev massif, which is comprised of riebeckite and aegirine granites of the Mesozoic. The pyroxene-fluorite metasomatites with rare-earth mineralization and fluorite-leucophane metasomatites form stratified apokarn and apocarbonate ore bodies.

Two territories are beryllium-bearing in the Urals, the Central and Polar Urals. In the central Urals in the Eastern Urals elevation there are two known ore regions, Izumrudny kopi [Emerald Crusts] and the Shilovo-Konev intrusion region, where deposits are in a beryl formation (greisen group). The Izumrudnyye kopi are located in the exocontact zone of the large, deeply eroded Aduy granite massif. The main object is the Malyshev deposit. Virtually the entire depth of ore formation has been surveyed. Many other deposits and ore manifestations of the region are of interest for emeralds but are very poor in beryllium ores. There are also several deposits of columbite pegmatites, and it appears that their reserves have been fully determined. In the superintrusive part of the Karasyev massif, which is one of the domes of the Shilovo-Konevsk intrusion, the Boyevskoye deposit has been surveyed. It is a fluorite-beryl type deposit with poor ores (0.12% BeO). In this same region there are a number of wolframite ore manifestations with beryl. In all, the Central Urals have been carefully searched, but potential reserves of ore may be hidden due to their poor detectability.

In the Polar Urals in the Kharbey anticlinorium there are several beryllium ore manifestations associated with Paleozoic granites. The beryllium mineralization (in the form of beryl, gadolinite, and phenacite) are in complex ore manifestations of two genetic types: tantalum-niobium formations of feldspar metasomatites and tungsten-molybdenum greisens. Due to the poor accessibility, the beryllium-bearing potential of the region remains unclear.

Having examined the known deposits and the prospects of ore manifestations, one can state that the beryllium

raw material problem may not be solved due to insufficient study of known ore sites. New deposits must be found with rich ores in accessible regions, and the technological problems of processing complex ores must be solved. Consequently, prediction-metallogenetic, exploration and evaluation, and technological work must be done. Studies to revise and further develop metallogenetic concepts on the patterns of configuration of beryllium deposits are necessary before this type of work can be undertaken. These studies must consider current tectonic, geochemical, and mineralogical concepts developed in the last 15-20 years. One of the goals of these studies should be the prediction of promising areas in accessible regions (although they may also be more hidden) based on analysis of the patterns of localization of known deposits.

OPTICS AND HIGH-ENERGY TECHNOLOGY

X-Ray Optics of Spectrometer for ITER

947F0199A Moscow FIZIKA PLAZMY in Russian
Vol 20 No 4, Jun 94 (manuscript received 20 Jul 93)
pp 596-597

[Article by V. A. Bryzgunov, A. B. Gilvarg, Institute of Crystallography imeni A. V. Shubnikov, Russian Academy of Sciences, and A. N. Svechkopal, "Kurchatov Institute" Regional Science Center, Institute of Nuclear Fusion; UDC 533.9.082.5]

[FBIS Abstract] While high-resolution x-ray spectroscopy has been successfully used for measuring ion temperature on large tokamaks, background fluxes of neutron and gamma radiation have now grown to levels that are unacceptable for such measurements. The authors look at an approach to solving the problem for the ITER by coupling x-rays out of the plasma radiation flux. X-rays can be appreciably deflected by a graphite mirror bent so that radiation reflected at optimum angles can be used in the spectrorometer. Such a reflector measuring 600 x 40 mm is made up of graphite components arranged on a cylindrical surface with 53 m radius. It is proposed that the spectrometer use a spherical quartz analyzer crystal (diameter 80 mm, $R = 4$ m, $2d = 1.624$ angstroms) and a coordinate detector with height $H = 20$ mm at a distance of a few cm. With the proposed design, 10 ms will be required for measuring the central ion temperature from Doppler broadening of the resonant line of helium-like krypton. The MCNP program for solving the transport equation in three-dimensional geometry by a Monte Carlo method was used to calculate background radiation fluxes. It is shown that geometric distortions in the spectrometer will be relatively minor. Figures 3, references 4.

Efficiency of Interchannel Signal Processing in a Pulsed Laser Locator With a Multielement Photodetector

947F0205A St. Petersburg OPTICHESKIY ZHURNAL in Russian No 4, Apr 94 pp 134-137

[Article by V. P. Kostin, Kiev Military Aviation School; UDC 621.383]

[FBIS Abstract] One possible method for improving the efficiency of a laser locator is to employ an algorithm for interchannel signal processing, whose essence lies in separating the adjoining photosensitive elements in groups. Methods were developed for computing the probability of target detection by a pulsed laser locator with a multi-element photo detector employing inter-channel signal processing with an independent signal processing in each channel. Efficiency of the inter-channel signal processing in a pulsed laser locator was estimated, and the optimal area of photosensitive elements for a maximum probability of detection with Poisson photoelectron statistic was determined. A block diagram of a device employing the algorithm for inter-channel signal processing in groups of four square-shaped photo sensitive elements is provided. Analysis of the interchannel signal processing indicates that the developed algorithm provides an improved value of the guaranteed minimum probability of target detection. Figures 3, references 4 Russian.

Robust Compilation of Images

947F0205B St. Petersburg *OPTICHESKIY ZHURNAL* in Russian No 4, Apr 94 pp 149-152

[Article by P. G. Popov, Siberian Scientific Research Institute of Optical Systems; UDC 621.391.172:621.397]

[FBIS Abstract] Systems of technical vision can incorporate several channels for obtaining video information. By combining the instruments operating in different spectral ranges, the area of problems for the solution of the entire system can be broadened and the system characteristic can be improved. A logical combining of images obtained in different channels is called a compilation of images. A method for the solution of this problem is proposed in this article. The method does not require accurate information about the statistical characteristics of the image and noise. The image can be subjected to significant linear and non linear distortion, and if the distortion of the phase spectrum is not large, the image is readily recognized. The algorithm is resistant to noise and a high quality informative image can be obtained. Figures 1, references 8: 5 Russian, 3 Western.

Reflection of a Directed Linearly Polarized Radiation From Agitated Sea Surface

947F0205C St. Petersburg *OPTICHESKIY ZHURNAL* in Russian No 4, Apr 94 pp 152-155

[Article by Ye. F. Demidov, Ye. V. Lukina; UDC 551.463.5:621.373.826]

[FBIS Abstract] Within the framework of a stochastic facet model of the sea surface, a method was developed for computing average energy and polarization characteristics of a directed linearly polarized radiation reflected from the sea. A bistatic probing mode was used. In essence, the method consists of finding the values of average coefficient of brightness and bearing of the

reflected radiation oscillations. Computation examples of these values are provided. The analysis of data indicates that with increased wind velocity, the characteristic curve of brightness coefficient expands in elevation as well as in azimuthal direction. Figure 1, tables 2, references 11: Russian 9, 2 Western.

Thermal Analog of a Laser

947F0206A St. Petersburg *ZHURNAL TEKHNIЧЕСКОY FIZIKI* in Russian Vol 64 No 4, Apr 94 pp 1-8

[Article by I. A. Novikov, Scientific Research Institute of Metrology, St Petersburg]

[FBIS Abstract] The operation concept of a thermal analog of laser or a Thermal Resonance Generator (TRG) is described. It is demonstrated that in a much the same way as a resonant generation of electromagnetic waves in an optical quantum generator, a resonance generation of harmonic heat waves with fixed frequencies is possible in a thermal media with memory. A mathematical model of the thermal resonance generator is developed. The determining relationships for the thermal flux density and the internal energy are included in this model, as well as equations dealing with conservation of the internal energy for a rod with a thermally insulated bottom and a heat exchange on the side. Under some conditions this thermal system exhibits a positive thermal feedback and is analogous to an optical resonator with an inversely applied media. The conditions for a stable resonant generation in a TRG are analyzed. A theoretical feasibility of developing a TRG is demonstrated. References 9: 6 Russian, 3 Western.

Destruction of Metal Foils Under Impact of Intensive Microwave Radiation

947F0206B St. Petersburg *ZHURNAL TEKHNIЧЕСКОY FIZIKI* in Russian Vol 64 No 4, Apr 94 pp 156-169

[Article by Yu. I. Zetser, V. A. Pushtarik, Geosphere Dynamics Institute, Moscow]

[FBIS Abstract] Interaction of a powerful microwave radiation with metal foils and features of their destruction due to microwave discharges generated at the surface is examined in this article. Reasons for generation and localization of these discharges and the generation processes in a closed and screened cavity of a secondary low frequency electromagnetic field are examined. Experimental studies were performed with a continuous and pulsed microwave irradiation of small, as well as large targets whose dimensions were 3-4 times larger than the diameter of the spot of microwave radiation. The experiments demonstrated that the principal mechanism of the target destruction is related not to a uniform heating of metal because of joule effect, but to a local heating of its surface due to discharges generated at

the film's surface. The effect of the target surface irregularities on the process of generation of near surface discharges was also examined. Figure 11, references 8: 6 Russian, 2 Western.

Contemporary Detectors of Opto-Acoustic Radiation

947F0204A St. Petersburg OPTICHESKIY ZHURNAL in Russian No 5, May 94 pp 3-13

[Article by N. A. Pankratov; UDC 621.384.326.2]

[FBIS Abstract] A review is made of the developments and state of the art at home and abroad of selective and non-selective opto-acoustic detectors of radiation. Properties and operation principles of both types are briefly discussed. The review includes opto-acoustic detectors with a plane camera, theoretical models of non-selective detectors, low frequency, fast acting and cavity detectors. Opto-acoustic detectors of a scattered and pulsed radiation as well as detectors for studying thermal and optical characteristics of solid bodies are also discussed. Diagrams of detectors for measuring scattered and pulsed IR-radiation and for determining thermal properties of solid bodies, coefficients of surface and bulk absorption, including a diagram and characteristic of raster thermal wave method for determining small coefficients of absorption of IR-radiation by solids are provided. Figures 10, references 59: 48 Russian, 11 Western.

Adaptive Neural Network for Classification of Images on a Structure-Like Noise

947F0204B St. Petersburg OPTICHESKIY ZHURNAL in Russian No 5, May 94 pp 38-41

[Article by A. V. Pavlov; UDC 535.317:007:681.3]

[FBIS Abstract] A neural network model for adaptive classification of images on a structure-like noise is proposed. The image and noise are treated as a realization of the same stationary random process. Opto-electronic realization of a neural network with a processor nucleus based on a holographic correlator is examined. The attention is focused on the stage of detection and separation from noise of a new image for subsequent classification. An algorithm for adaptive classification of images on a complex noise has been developed and its block diagram is provided. The neural network model is capable of solving the problem of adaptive classification of images on a complex noise, including images masked in noise. The significant feature of the model is the feasibility of a multifunctional application of a holographic correlator as a single processor nucleus of the network. Figures 4, references 11: 3 Russian, 11 Western.

Pulsed Dense Gas Lasers Pumped by Self-Sustained Discharge

947F0200A Moscow IZVESTIYA AKADEMII NAUK: SERIYA FIZICHESKAYA in Russian Vol 58 No 2, Jun 94 pp 55-59

[Article by N. I. Lomayev, A. N. Panchenko and V. F. Tarasenko, Institute of High-Current Electronics, Siberian Department, Russian Academy of Sciences, Tomsk; UDC 621.373.326.038.823]

[FBIS Abstract] The authors give the energy, spectral and time characteristics of lasing on wavelengths of 308 and 337 nm in SF₆-F₂ mixture on DILAN-M and LIDA-M lasers, and also the characteristics of lasing on HF molecules (wavelength of roughly 2800 nm). The lasers were switched by industrial RU-75 and RU-75/0.5 dischargers. Stable operation with increasing prf was achieved by self-pumping or by electric wind. On some lines in the range of 2.6-3.0 μ m, radiation energy of 60 mJ was attained at efficiency of 1.4 percent. It is shown that electric wind can increase the prf of nitrogen and XeCl lasers to 50 pps. The LIDA-M laser can produce pulses on a wavelength of 308 nm with duration of 250-300 ns, energy as high as 1.3 J and efficiency up to 3 percent. By varying mixture composition and cavity geometry in the investigated lasers, lasing can be generated on wavelengths ranging from 147 to 10,600 nm. Figures 3, references 12.

Phase Conjugation in Four-Wave Interaction With Feedback in Active Media of CO₂ and CO Lasers

947F0200B Moscow IZVESTIYA AKADEMII NAUK: SERIYA FIZICHESKAYA in Russian Vol 58 No 2, Jun 94 pp 60-67

[Article by M. G. Galushkin, K. V. Mitin and A. M. Seregin, Process Laser Research Center of the Russian Academy of Sciences, "Granat" Special Design Office State Enterprise; UDC 621.373:826]

[FBIS Abstract] A theoretical investigation is made of the energy parameters of a phase-conjugate reflecting mirror, using four-wave mixing with feedback in the active media of beam-controlled CO₂ and CO lasers. The analysis covers determination of the nonlinear parameters of the active medium, and calculation of emission intensity in a ring cavity with nonlinear mirror, allowing for saturation of the amplifier. It is shown that near 100 percent reflectivity can be attained in the active medium of a CO₂ laser for time resolution of the phase-conjugate mirror of roughly 5×10^{-6} s. Relatively large lengths of wave interaction improve the quality of phase conjugation in the active media of these lasers. Figures 7, formulas 18, references 15.

Long-Pulse XeCl Laser Emission of Ultrashort Pulse Sequences With Continuously Tunable Wavelength

947F0200C Moscow IZVESTIYA AKADEMII NAUK: SERIYA FIZICHESKAYA in Russian Vol 58 No 2, Jun 94 pp 73-80

[Article by S. V. Yefimovskiy, A. K. Zhigalkin, Yu. I. Karev and S. V. Kurbasov, Lebedev Physics Institute,

Russian Academy of Sciences; UDC 621.373.826.038.823]

[FBIS Abstract] In previous research by these authors and A. Z. Grasyuk, sequences of up to 50 ultrashort pulses were generated on a 250 ns XeCl laser with cavity length of 75 cm. The minimum measured individual pulse duration was about 150 ps. Ultrashort pulse duration did not depend significantly on cavity length within a range of several millimeters. In this paper, the authors look at the possibility of further shortening duration and improving stability of ultrashort pulses emitted by the XeCl laser, as well as the feasibility of continuous tuning of the pulse frequency. The research was done with a long-pulse laser capable of generating pulses with half-amplitude duration of about 500 ns in the free lasing mode. An intracavity Fabry-Perot standard was used for continuous adjustment of the frequency of ultrashort pulse sequences by 100 cm^{-1} (variation of central wavelength in a range of 307.6-308.6 nm). Experiments yielded trains of as many as 60 pulses with individual pulse duration as short as 100 ps. In the opinion of the authors, it should be possible to get pulses shorter than 10 ps with complete mode locking by using an attached cavity. Figures 5, references 18.

Laser System With Wavelengths of 307.65-308.5 and 457.6-459.3 nm Based on XeCl Lasers and Lead Vapor SRS Cell

947F0200D Moscow IZVESTIYA AKADEMII NAUK: SERIYA FIZICHESKAYA in Russian Vol 58 No 2, Jun 94 pp 121-124

[Article by V. B. Kaul, S. V. Melchenko, A. N. Panchenko and V. F. Tarasenko, Institute of High-Current Electronics, Siberian Department, Russian Academy of Sciences; UDC 621.373.826]

[FBIS Abstract] The paper gives the results of experimental studies of a laser system that includes a tunable XeCl laser, XeCl amplifier, and lead vapor SRS cell. UV laser emission is obtained that is tunable over a wavelength range of 307.65-308.5 nm with output energy as high as 250 mJ, line width of 0.1 nm, beam divergence of 10^{-4} rad, and signal contrast relative to broad-band noise of more than 100. Use of a lead vapor SRS cell enabled tuning in the visible band over a wavelength range of 457.6-459.3 nm with quantum yield of SRS conversion as high as 90 percent. Figures 2, references 7.

Active Medium of Excimer Laser as Phase-Conjugate Reflecting Mirror in Ultraviolet Band

947F0200E Moscow IZVESTIYA AKADEMII NAUK: SERIYA FIZICHESKAYA in Russian Vol 58 No 2, Jun 94 pp 125-132

[Article by M. G. Galushkin, Ye. B. Gordon, M. S. Drozdov and Ye. Yu. Polyakov, Process Laser Research Center of Russian Academy of Sciences, Affiliate of

Institute of Energy Problems of Chemical Physics of Russian Academy of Sciences; UDC 621.375.826]

[FBIS Abstract] The article is a theoretical study of phase conjugation with degenerate four-wave interaction in the active medium of an XeCl laser. Coefficients of reflection are calculated for the case of degenerate four-wave interaction in the active medium of the XeCl laser. An analysis is made of the way that the coefficient of reflection depends on the parameters of the amplifying medium. It is shown that light-induced thermal nonlinearity and gain nonlinearity can give relatively high coefficients of reflection with degenerate four-wave interaction for narrow-band XeCl laser emission. Figures 4, formulas 24, references 17.

Adaptive Correction of Direction of Laser Beam Propagation in Turbulent Atmosphere

947F0200F Moscow IZVESTIYA AKADEMII NAUK: SERIYA FIZICHESKAYA in Russian Vol 58 No 2, Jun 94 pp 150-156

[Article by G. M. Samelson, Institute of Applied Physics Problems, St. Petersburg; UDC 621.375:826:535.3]

[FBIS Abstract] An investigation is made of the effectiveness of a phase conjugating system for correcting the direction of propagation of laser beams in a turbulent atmosphere from the standpoint of a possible increase in average intensity on the beam axis, and the feasibility of pressure correction of intensity fluctuations. An attempt was also made to determine more precisely the magnitude of random shifts of the beam, and the way that these shifts influence intensity statistics. All calculations were done for beams with minimum cross section (allowing for diffraction), i.e. for a beam focused in the reception plane, and for a collimated beam with Fresnel number equal to one. The correction to the average intensity approximation is calculated for the variance of random shifts of the center of gravity of the beam in the reception plane. A physical interpretation is given for the phenomenon of amplification of intensity fluctuations on the axis of narrow collimated beams under conditions of strong turbulence. Figures 3, formulas 8, references 15.

NUCLEAR AND NON-NUCLEAR ENERGY

Steam-Gas Technologies in Central Heating

947F0184 Moscow TYAZHELOYE MASHINOSTROYENIYE in Russian No 4, 1994 pp 2-11

[Article by V. I. Dlugoselskiy, B. L. Barochin, All-Union Scientific Research and Design Institute of the Energy Industry; UDC 621.311.2.22]

[FBIS Abstract] The use of steam-gas installations, gas turbines, and steam turbines is addressed. Gas turbines should only be used for central heating and only if the

outgoing gas heat can be used in other parts of the system. Of particular interest is the use of gas turbines in conjunction with hot-water boilers. The use of hot-water "utilizer" boilers is preferable to using steam boilers or surface economizers with gas turbines. The installation of steam-gas installations in power plants which use organic fuel makes them more efficient. High-pressure, low-pressure, and steam models are examined. Systems with utilizer boilers and discharge boilers are found to be equally efficient. Efficiency is primarily affected by the initial steam parameters. It is noted that gasification of coal, an efficient energy source, is still in the design stage in Russia. The current state and prospects for the development of production of turbines are examined. Tables provide specifications for stationary, aviation, and marine turbines. Interest in aviation turbines has grown due to the conversion process from military to civilian production. Specifications of planned central heating plants with steam-gas units, hot-water boilers, and gas turbines are presented. Steam-gas units are found to be more economical than steam power plants. Tables 6; references 3 (Russian).

Increasing Economic Criteria's Role in Ukraine's Power Industry Management

947F0198A Kiev TEKHNIЧЕСКАЯ
ELEKTRODINAMIKA in Russian No 1, Jan-Feb 94
pp 64-68

[Article by A.K. Shidlovskiy, K.V. Korobchuk, Electrodynamics Institute at the Ukrainian Academy of Sciences, Kiev; UDC 621.311.16]

[FBIS Abstract] Runaway inflation and rapidly rising prices of energy sources increase the urgency of improving the power utilization efficiency and largely overhauling the existing system of economic relations among all players in the traditional generation-transmission-distribution-consumption chain, allowing for the development of a functioning power market and real economic incentives on part of all links in this chain in order to address crucial power supply issues. The experience accumulated by such foreign companies as Putnam, Hayes Bartlett, Electricite de France International, etc., and integrated dispatcher control (or pool) practices in the United States are discussed, and the main elements of the proposed future national power management center (NDTs) are outlined. It is stressed that the yield can be maximized only by developing a comprehensive system which encompasses all aspects of economic activity and fully takes into account the proposed management restructuring. The importance of continuing to increase the use of computer-aided systems and enhancing energy conservation practices is emphasized. The operation of existing computer-aided supervisory control (ASDU) systems and the EPOS software package linked to a real-time database of the on-line computer system (OIK) are described. It is noted that success of the program depends on cooperation of individual power systems and scientific and research institutes. Figures 1.

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INDUSTRIAL ENGINEERING

Nitrogen-Microdoped Steel Rails

947F0194A Dnepropetrovsk METALLURGICHESKAYA I GORNORUDNAYA PROMYSHLENNOST': NAUCHNO-TEKHNICHESKIY I PROIZVODSTVENNYY SBORNIK in Russian No 1(171), Jan-Mar 94 pp 26-28

[Article by N. F. Levchenko, V. V. Mogilnyy, Kuznetsk Metallurgical Combine, V. A. Parshin, "Teznomet-NT" Scientific Production Joint Stock Company, V. A. Reykhart, All-Russian Scientific Research Institute of Railroad Transportation, N. N. Razinkova, Ukrainian Scientific Research Institute of Metallurgy, and V. S. Pasko, Ukrainian Scientific Research Institute of Metallurgy; UDC 621.771.262:669.15-194:661.938]

[FBIS Abstract] The paper gives the results of an industrial trial in producing heat-hardened rails made from steels microdoped with nitrogen-containing material, including carbamide. Test results show that substituting technology of microdoping rail steel with nitrogen by using carbamide in place of costly ferroalloys like FeSi-CaVN will reduce expenditures without sacrificing quality of finished rails. The specific savings will be 82.6 rubles per metric ton in January 1992 prices. Other benefits would be minimum content of O₂, maximum degree of dispersion and low contamination with sulfide inclusions, high activity of nitrogen dissolved in the steel, resulting in a 39-50 percent increase in dispersed particles of AlN in the rail metal following heat treatment, an increase in ultimate strength by 80-88 N/mm² and in $\sigma_{0.2}$ by 20-40 N/mm², improved ductility, an increase in impact toughness of the hardened rail metal at +20°C by 10-15 J/cm² and TU 14-2-886-90. Comparative analysis of quality indicators of the investigated rails and group I steel made at Donetsk Metallurgical Combine in accordance with standard GOST 24182-80 shows that nitrided steel rails are more inclined to develop aging processes, have a greater degree of non-uniformity of the distribution of total oxygen content and fluctuations in fatigue strength and impact toughness as determined on specimens cut from head and foot samples, as well as from different parts of the profile (head, web and base). Improvements have to be made in the nitriding method to get optimum amounts and proportions of microdoping nitride-forming additives (aluminum, titanium, vanadium and so on), and in the

technology of melting and teeming the nitrided steel: the amount of carbamide added to the ladle and mold, the technique of preparation. Studies should be done on carbamide nitrogen saturation of ferroalloys used in producing rail steel. Figure 1, table 1.

Automated System for Controlling Rail-Grinding Train

947F0193A Moscow TYAZHELOYE
MASHINOSTROYENIYE in Russian No 2-3,
Feb-Mar 94 pp 9-11

[Article by N. I. Zhmurova and A. S. Novikov, VNIIAM;
UDC 681.51]

[FBIS Abstract] A rail-grinding train has been developed that includes a diesel locomotive, power car, a diesel car with track testing truck, six working cars with grinding carriages and a caboose with track testing truck. The ten units of rolling stock measure 250 m in length overall. Each track testing truck accommodates 32 sensors for rail measurements: 8 sensors on each rail for measuring wavelike unevenness, and 8 sensors on each rail for profile measurements. The grinding equipment removes 0.3 mm of steel per pass. The leading testing truck gathers information about the state of the rails on the first pass, the grinding equipment is set to initial parameters, and the trailing testing truck feeds data on the current state of the track and the necessity of additional passes to the operator's console in the caboose. In addition, the status of each car in the system is monitored, and this information is provided to the operator. If additional passes are needed, the grinding equipment is automatically set, and work proceeds in the opposite direction. Grinding parameters may also be manually set. The paper details the operation of the two-level hierarchical distributed system for automatic control of track measurement and grinding operations. The upper level performs diagnostic-information and overall control functions, while the lower level is dedicated to control of individual processes. The control system uses "Elektronika-60" microcomputers. Communication between upper and lower levels is via asynchronous serial channels with period of 100 ms. The system design is simple and flexible enough to be adapted to other control objects. Figures 3, references 3.

Wall-Climbing Robots: An International Contest

947F0167A Moscow MOSKOVSKIYE NOVOSTI
in Russian No 18, 1-8 May 94 p 6

[Article by Yuriy Ponomarev: "Wall-Climbing Robots:
An International Contest"]

[FBIS Translated Text] Aside from a MLTK-50 mobile laser complex (see "Moskovskiy Novosti" No 16), the exhibits presented by the Russian Federation at the international fair in Lillehammer, Norway, will include a robot that can move on vertical services and perform various industrial operations.

It is not generally known that robots have been taking part in international contests since September 1990. The First International Robot Olympics, held in Glasgow in Scotland, was a competition of 63 robots from 11 countries: USSR, United States, France, Germany, United Kingdom, Japan, and others. The Soviet products RVP-1M and RVP-2M won the first place in the class of wall-climbing robots and were "awarded" medals.

Since then, the staff of the robotics and mechatronics laboratory of the Institute of Problems of Mechanics of the Russian Academy of Sciences (IPM RAN) have developed several new robots, which, like wood frogs, can move on vertical walls and ceilings.

The comparison of these Russian robots with wood frogs is not accidental: both are able to move on vertical surfaces because they have "paws" with suction disks. More than 20 members of the staff of IPM RAN, headed by professor V. G. Gradetskiy, have worked on solution of this scientific and engineering problem for over a decade.

The mechanism of this robot is based on the principle of building a vacuum under the suction disks of the robot's "legs." This is done by an ejector device, allowing the robot to move on steel, glass, concrete, brick and wood surfaces. The efficiency of vacuum suction disks is such that a robot weighing 70 kg can carry a payload of 100 kg.

The design of these robots is unique and simple. Each robot consists of two platforms, each with a group of vacuum grips made of thermally stable impermeable material. The platforms move relative to each other: when one platform is firmly attached to the wall, the other moves forward and gets "sucked up" to the surface. The two platforms are linked by a rotary joint. When the robot must turn right or left, the moving platforms are rotated relative to each other. The reliability is enhanced by a dynamic separation of all motions of pneumatic drives and ejection of each of the eight vacuum grips arranged on the two platforms.

The robots have two rates of speed: marching, or walking, speed (approximately 2 m/sec) and continuous, or smooth, speed (20-30 mm/sec). The smooth speed is needed for transportation of payloads with a high dynamic accuracy to a specified height. The robot is controlled by an operator through a wire communication link from a ground control panel.

The IPM RAN has developed seven models of robots, including a fire-fighting robot and a vacuum-cleaning robot for decontamination of rooms in a nuclear power plant. According to statistical data, damage caused by fires at major industrial enterprises results in complete demolition of plants in 43 percent of cases and a significant reduction of output in 23 percent. Fire hazard is especially dangerous in machine halls of nuclear, thermal and hydroelectric power plants, large factory shops, oil storage facilities and reservoirs of liquid fuel, where fires often lead to human casualties. In the 1980s, an average of 250 fire-fighters were killed in the United States while

fighting fires. In Russia, some of the most disastrous fires occurred at oil storage facilities, on 8 Apr 85 in Moscow and 18 Mar 86 in Kirishy. The damage was assessed at tens of millions of "old" Soviet rubles.

The fire-fighting technology practiced at present is inadequate for suppressing fires in an oil reservoir, because the reservoir's "floating" roof becomes warped and prevents the foam-spraying comb unit from advancing close to the fire. In this case it becomes necessary to cut a "window" in the wall of a vessel which is on fire. The fire-fighting robot is designed for this dangerous task.

When a fire starts in oil or fuel storage, a cart carrying the robot approaches the burning reservoir, the robot "sucks up" to the metal surface and climbs the wall to reach the border zone between oil and the cavity where the flames are raging. The temperature gradient at that location is extremely steep. The temperature above the boundary zone exceeds 1000°C, and the robot cannot climb any further. Using a manipulator "hand" with a gas torch, the robot cuts an opening in the metal wall of the reservoir and then uses the other "arm" to pump flame suppressant fluid through a hose into the window. The body of the fire-fighting robot and the supply hoses are coated with heat-resistant metalized silicon fabric to protect them from heat radiation.

The staff of the All-Russian Scientific Research Institute of Fire Fighting (VNIPO MED RF), headed by Col. L. M. Meshmann, helped the scientists and engineers of IPM to develop the fire-fighting robot. Fire-fighters under the leadership of Lt.Col. Yu. S. Zaets have successfully tested the "metal fireman" on a testing range in Kapotnya. IPM RAN is now developing fire-fighting robots for exploration of ignition sources and rescue work during fires in high-rise buildings.

Both robots have been tested successfully, and a Tula military factory is ready to begin manufacturing them. However, lack of investment has delayed mass production.

In the meantime, the staff of IMP RAN continues to develop new robots. They are currently working on an "inspector" robot for troubleshooting of internal surfaces. The new robot will move along horizontal and vertical pipes of a large diameter and even enter branch pipes. In the future, scientists plan to develop a self-contained robot controlled by an on-board computer.

One hopes that the new generation of Russians, currently struggling to restore capitalism in this country, will live

to see the time when Russian climbing robots will wash windows in high-rises, take part in construction of tall buildings, climb ship sides in shipyards, paint television towers, vacuum-clean ceilings in nuclear power plants and explore the interior of oil and gas pipelines with testing and measurement instruments.

Telephones of IPM RAN Robotics Laboratory: 434-41-49 and 433-77-66.

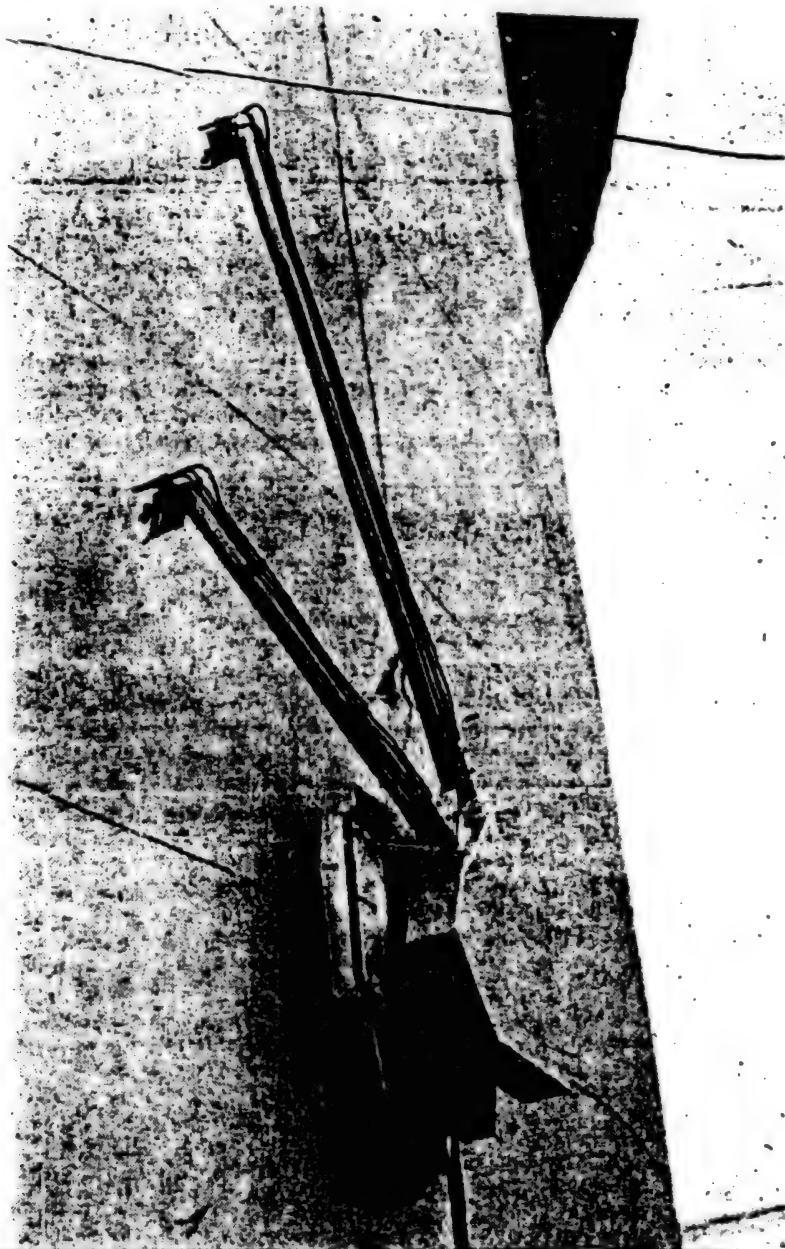
P.S. According to the data of All-Russian Scientific Research Institute of Fire Fighting, direct and indirect damage from fires at reservoirs of oil storage facilities in 1993 amounted to 100-200 million rubles. Fire-fighters report that the damage estimates are approximate, because for many years managers of state-owned reservoir facilities deliberately underreported fire damage to protect themselves from responsibility. The environmental damage was hardly ever assessed at all.

Specifications of Vertical Motion Robots

Drives	
Drives	pneumoelectric
Working pressure	0.6 MPa
Air flow rate	20 m ³ /hr
Load-carrying capacity	from 20 to 100 kg
Robot dimensions	
	500 400 200 mm
	900 600 200 mm
Platform dimensions	400 600 mm
Weight	15—110 kg
Method of attachment	vacuum
Control	positional, discrete

Specifications of the Gidra-II Robot

Load-carrying capacity	
during motion	100 kg
in stationary position	250 kg
Weight	38 kg
Working pressure	0.5—0.55 MPa
Maximum step	300 mm
Speed	(17—50) mm/sec
Rotation radius	180 deg
Dimensions	1120 560 430 mm



Fire-fighting robot during a test on a VNIPO range in Kapotnya near Moscow.

Procedure for Conducting Friction Tests at Supersonic Sliding Velocities

947F0186A Minsk TRENIYE I IZNOS in Russian
Vol 15, No 1, 94 (Signed to press 3 Jan 94) pp 71-77

[Article by Yu. A. Karpenko, N. A. Bushe, I. S. Gershman, Ye. V. Chernina, V. G. Kamchatnyy, N. N. She-myakin and N. V. Penskiy, VNIPIET All-Russian Plan-ning, Design, Scientific Research and Technological Association, St. Petersburg, All-Russian Scientific

Research Institute of Experimental Physics, Arzamas, and All-Russian Scientific Research Institute of Rail Transportation, Moscow; UDC 621.316:531.44:530:096]

[FBIS Translated Text] Many researchers have studied problems concerned with selecting friction pairs, the conditions of their operation, and assessing the param-eters of friction interaction of materials at high sliding velocities [1-6].

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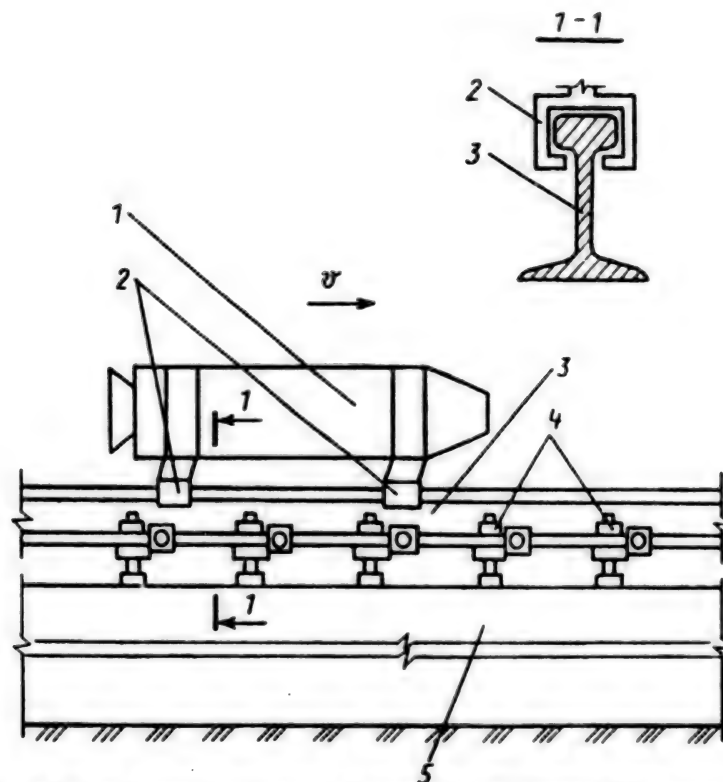


Figure 1. Diagram of the Device: 1—accelerating unit; 2—material specimens (sliding supports); 3—guide rail; 4—guide rail fastening and adjusting units; 5—bearing structure

This paper presents the procedure and results of experimental research on friction of a metal-metal pair without lubrication and a small coefficient of mutual overlap, a high sliding velocity and significant unit pressure at the sliding contact.

Testing Procedure

A device (Figure 1) consisting of a guide (counterbody) mounted on beams connected to a foundation, an accelerating unit, resources loading the samples, and a measuring and information system was used to study friction of steel specimens [3,4,7].

The guide is made from R-65 rails with a milled head surface; the state of the working surfaces of the rail head corresponds to class 6 roughness. The rails consist of M-70 steel with Brinell hardness $HB=2,070$ MPa. Rail segments 20 m long are butt-welded together. The straightness of rail installation is verified by optical instruments with a precision of up to 0.1 mm per 1 m of track in both the vertical and horizontal planes.

A powder jet engine installed on a truck moving over the monorail guide is used as the accelerating unit. The accelerating truck communicates with the guide rail by means of two sliding supports (shoes) that wrap around the rail head [4,7].

The material specimens are loaded in friction tests using this device by two means, each of which imposes requirements on the shape and geometric dimensions of the specimens of material to be investigated. In the first, the material specimens are manufactured in the form of sliding shoes, on which the accelerating truck is mounted. Besides the loads produced by the weight of the truck itself and the accelerating unit, friction forces of the jet engine, the forces of aerodynamic resistance of air and friction forces act as the truck moves [4,7]. Relationships determining change of external loads and reduction of the weight of the jet engine (owing to fuel combustion) during movement are determined experimentally and by calculation with regard for the particular features of the specific device.

Misalignment of the points of application of external forces relative to the truck's center of mass is responsible for the appearance of moments relative to the center of mass in both the vertical (longitudinal) and horizontal planes. The small dimensions of the shoes in comparison with the base length of the accelerating truck and presence of structural gaps make it possible to assume that the rail offers hinged support, and to determine the values of the vertical forces acting upon the sliding shoes, equating to zero the sum of the moments of the acting loads relative to the centers of mass of the sliding supports.

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In the second means of loading, friction brake units are used—special shoes that transmit a normal load to the upper surface of the rail head by means of a pneumatic system and pistons, the reactive force of which is absorbed by the lower grippers (Figure 2). Thus friction occurs in the unit under braking conditions on two surfaces of the rail head—upper and lower. The pressure in the pneumatic system ($p=10-100$ MPa) is generated by a powder pressure accumulator [3,4,7]. In this case the material specimens are made as removable plates (an upper and a lower lining on the rail head), and are fitted within the shoe. The friction brake unit is mounted in front of the accelerating truck, and it begins working after a prescribed velocity is attained, at the moment a signal is transmitted from the control console. The velocity of the accelerating truck is determined from the results of recording the moments of activation of sensors on the track.

When analyzing the operating parameters of sliding friction units in both the first and second means of loading, we need to consider that the nominal pressure in the zone of contact is determined not only by the magnitude of the external normal pressure but also by inertial loads evoked by deformations of the guides beneath the moving load, and by presence of undulations and errors in the shape of the real surfaces of friction pair elements. As sliding velocities increase, not only do the noted circumstances bring about nonuniform loading of the working surfaces over the nominal area of contact, but also any gaps that are present (structural, and those formed as a result of linear wear of the materials of the pairs) lead at some moments in time to complete loss of contact between the friction pair elements. In this case transition from continuous interaction of the participants of movement to discrete interaction is possible.

Determining dynamic pressure upon high-speed sliding contacts in the presence of discrete interaction between elements of a vibrating system is a rather complex problem in both the theoretical and the experimental aspect. Consequently the results of research using state-of-the-art technical resources on the surface layers of specimens subjected to friction tests at high sliding velocities is of great practical interest to qualitative evaluation of different theories of contact interaction [2,4,6].

Experimental Results

The first means of loading was used in tests on specimens made from 30KhGSA steel. The length of the specimens was 150 mm, and thicknesses were 10 mm for specimen 1 and 20 mm for specimens 2 and 3. To protect the surface layers of the rubbing parts of the specimens from wear (after attaining the prescribed sliding velocity), the accelerating truck was allowed to slip off the guide into a pile of dirt.

For specimen 1 (the front shoe of the accelerating truck) the sliding velocity v was 1,500 m/sec at a calculated normal pressure of $p_n=3.0$ MPa. Friction occurred over

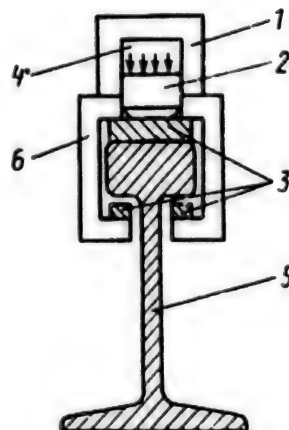


Figure 2. Diagram of the Friction Brake Unit: 1—pressure accumulator; 2—piston; 3—material specimens (inserts); 4—working chamber; 5—rail; 6—brake shoe

the upper surface of the rail head. Linear wear of the working part of specimen 1 after the end of the experiment was 3.5 mm.

Specimens 2 and 3 (the lower grippers of the rear and front shoes of the accelerating truck) were tested at sliding speeds of 880 and 730 m/sec respectively. The calculated normal pressure was 5.5 MPa for specimen 2, and 5.7 MPa for specimen 3. In this case the time of interaction with the counterbody was 2 sec for specimen 2 and 0.5 sec for specimen 3. After the experiment the following magnitudes of linear wear of the working parts of the specimens were documented: 18 mm for specimen 2, and 3.9 mm for specimen 3.

The second means of loading was used in tests on specimen 4 (material—St3, lower insert of the friction brake). The specimen was 200 mm long and 15 mm thick. The friction brake unit was activated after the accelerating truck attained a velocity of 400 m/sec; in this case the pressure of working gases in the space above the piston was 120 MPa, and the calculated nominal pressure on the specimen was $p=27$ MPa. After the accelerating truck and friction brake unit came to a complete stop a 1.5 mm decrease in the thickness (height) of the specimen was documented, basically due to change in the geometry of its cross section. Plastic shape change of the specimen's surface layers is the result of worsening of the mechanical characteristics of the material owing to friction heating, and the influence of sizable normal loads and friction forces [3,6].

X-ray photoelectronic spectroscopy and the electronic microanalyzer of a scanning electron microscope were used to study the chemical and elemental composition of the friction surfaces of the steel specimens. Use of the microanalyzer of a scanning electron microscope made it possible to analyze the elemental composition averaged

over a depth of around $1\ \mu$ and over an area of several dozen μ^2 . For comparison, an analysis was made of a surface not subjected to friction. The results are shown in Table 1. X-ray photoelectronic spectroscopy was used to investigate monatomic layers over the entire surface. The spectra were taken of several monatomic layers after etching the surface to a depth of 2-5 nm. The elemental

composition of the surface layer was determined. The chemical composition of this layer was calculated by analyzing the spectra. The results are shown in tables 2 and 3. The difference in the results of analyzing the compositions of surface layers obtained by the indicated procedures were the result of different depths and areas of averaging of the portion of the surface under investigation.

Table 1. Elemental Composition (Percent by Weight) of Friction Surface

Specimen	Testing Parameters		C	O	Fe	P	S	Si	Mn	Cr
	v, m/sec	p_a , MPa								
1	1500	3.0	0.57	1.96	86.50	0.03	0.06	0.72	0.90	0.87
2	880	5.5	19.7	14.53	62.55	0.07	0.44	0.84	0.68	0.80
3	730	5.7	19.29	12.59	60.21	0.03	0.33	0.66	0.60	0.83
4	400	27.0	8.46	3.14	81.67	0.03	0.12	0.27	0.51	0.05
2	-	-	2.23	-	96.69	0.02	0.01	0.91	0.03	0.97

Table 2. Elemental Composition (Percent by Weight) of the Surface Layer of Secondary Structures

Specimen	Testing Parameters		C	Mn	Cr	S	Cl	Fe	N	O
	v, m/sec	p_a , MPa								
1	1500	3.0	1.8	4.8	6.3	0.4	0.5	68.7	-	17.5
3	730	5.7	2.8	4.5	9.0	0.5	0.5	62.6	0.4	19.7

Table 3. Chemical Composition (Percent by Weight) of the Surface Layer Secondary Structures

Specimen	Testing Parameters		Cr_2O_3	Mn_2O_3	FeCr_2O_4	MnO	Fe_2O_3	Fe_3C	MnO_2	Fe	S	Cl	C	N
	U , m/sec	p_a , MPa												
1	1500	3.0	8.6	3.4	0.5	0.1	41.1	0.5	3.7	39.5	0.4	0.5	1.7	-
3	730	5.7	12.2	6.5	1.1	-	46.5	2.6	0.2	29.7	0.2	0.2	3.8	0.1
Melting or decomposition point of compounds, °C			2335	1000	1830	1842	1563	1700	535	-	-	-	-	-

The microstructure of surface layers was studied using a Neophot-21 optical microscope ($\times 100$ and $\times 500$). Microhardness was determined with a PMT-3 instrument at a load of 50 gm. Microstructure was investigated using microsections in a plane perpendicular to the sliding plane and parallel to the sliding direction.

It follows from the results obtained with the microanalyzer (Table 1) that the surface layer is richer in oxygen and carbon (with the exception of specimen 1) and poorer in iron than the base layer. It should be noted that the surface layers of specimens 2 and 3 contain significantly more oxygen and carbon and significantly less iron than the surface layers of specimens 1 and 4.

It was shown by X-ray photoelectronic spectroscopy (Table 2) that the surface layers of specimens 1 and 3 were richer in carbon, manganese, oxygen and chromium, and poorer in iron. The general trend noted in the results obtained with the microanalyzer also persists in

the results obtained using X-ray photoelectronic spectroscopy. The surface layer of specimen 3 contains more carbon and chromium and less iron than specimen 1. A somewhat higher oxygen concentration is noted in the surface layer of specimen 3 than in specimen 1.

Table 3 gives the results of calculating chemical composition on the basis of an analysis of spectra obtained by X-ray photoelectronic spectroscopy. This table also gives the melting or decomposition points of the corresponding chemical compounds. The base of the surface layer of the specimens consists of iron oxide Fe_2O_3 and free iron, and all free carbon is located on the friction surface in the form of graphite. Mention should be made of the relatively high concentration of high-melting oxides and carbides (Cr_2O_3 , Cr_3C_2 , Fe_3C). In this case there are more low-melting compounds in the surface layer of specimen 3 than in the surface layer of specimen 1: Cr_2O_3 , Cr_3C_2 , Fe_3C . The surface layer of specimen 1

contains significant quantities of the oxide MnO_2 , which decomposes at a low temperature, and free iron.

Metallographic research showed that the depth of the zone of alteration as a result of friction varies in all specimens within 100-500 μ , while in some cases it attains 1,000 μ . The microhardness of the altered zone is 3,900 MPa for specimen 1, 6,600 MPa for specimen 2, 6,100 MPa for specimen 3, and 5,500 MPa for specimen 4. The existence of a layer around 30 μ thick resistant to etching was noted at the friction surface of specimen 1. The microhardness of this layer is 7,600 MPa. The microhardness of the base of all specimens was 2,500-2,700 MPa. Traces of melting and plastic deformation were not detected in surface layers.

Discussion of Results

Research on the surface layers and secondary structures on friction surfaces established that all free carbon is present on the friction surface in the form of graphite. This helps to reduce the coefficient of friction f and the intensity of wear.

Intensive wear of all specimens indicates that the dynamic nominal pressure p_d on sliding contacts at the moments of interaction of friction pair elements is basically equal to the current hardness of the surface layers of the material making up the sliding supports. Thus the friction power $f p_d v$ realized during the testing was determined chiefly by the sliding velocity.

The prescribed unit friction power values $p_d v$ in tests on specimens 1, 2 and 3 were close (4.50 MW/m², 4.840 MW/m², 4.160 MW/m² respectively). Considering this circumstance and assuming that thermophysical processes and mechanisms of wear were identical in nature for specimens 1, 2 and 3 in the tests, the results of determining elemental composition of surface layers of the specimens may be used to evaluate the influence of sliding velocity on adaptability of friction surfaces.

It follows from results obtained with the microanalyzer that the surfaces of specimens 2 and 3 are enriched to the greatest degree by impurities (oxygen and carbon) and stripped of iron ($v=880$ and 730 m/sec respectively). The surface of specimen 4 is enriched by impurities and stripped of iron to a lesser degree ($v=400$ m/sec). The surface of specimen 1 is least enriched by impurities and stripped of iron ($v=1,500$ m/sec). The same trend is observed in the results of elemental analysis using X-ray photoelectronic spectroscopy.

The results show that the material of sliding supports exhibits the best adaptiveness at close values of the prescribed unit friction power without lubricant at velocities of 730 and 880 m/sec. The highest concentration of oxygen and carbon was revealed in the surface layers of specimens 2 and 3, which provides the best conditions for oxidative wear, in the presence of which we observe the least intensity of wear owing to reduction of the concentration of the base metal (iron) in the surface layer.

As sliding velocity increases the degree of concentration of heat liberated by friction increases in the surface layers of the materials of the interacting bodies [4,6]. Therefore a higher concentration of high-melting carbides and oxides in the surface layer of specimen 3 ($v=730$ m/sec) in comparison with the chemical composition of the surface layer of specimen 1 ($v=1,500$ m/sec) may be elicited by a decrease in friction heating of specimen 1 owing to removal of heat from the zone of contact as a result of stripping of the hottest layers of the material. It should be noted that in this case friction forces increase due to growth of the mechanical strength of the surface layers of the material making up the sliding element [5].

The time of existence of actual points of contact decreases as sliding velocity increases when friction occurs over a fresh track—that is, the duration of periods of heating and cooling decreases [6]. The relatively high concentration of the low-temperature oxide MnO_2 in the surface layer of specimen 1 may be associated with this. If the temperature at the actual points of contact of specimen 1 exceeded the melting point of Cr_2O_3 , then oxygen could attain a considerable level of supersaturation by dissolving in the surface layer of the metal. During cooling, the high-temperature region apparently passed by too quickly to allow formation of a sufficient quantity of high-temperature oxides, and a large quantity of oxygen in the low-temperature region remained in a supersaturated solid solution. This is why the oxide MnO_2 formed in this range of temperatures (<535 °C).

Obviously secondary structures on the friction surfaces of specimens 1 and 3 are dissipative structures. But while at $v=730$ m/sec the nonuniformity of their formation reveals itself as formation of a relatively large quantity of graphite, at $v=1,500$ m/sec it reveals itself as formation of supersaturated solid solutions.

Despite the fact that the temperature at actual points of contact of specimens 1, 2, 3 and 4 may have exceeded the melting point of the base material (iron) during sliding [1-4,6], no traces of melting and plastic deformation were discovered in the surface layers. This may be associated with the fact that at sliding velocities of 400, 730 and 880 m/sec the bulk of the energy was expended on formation of oxides and graphite. At a velocity of 1,500 m/sec these channels of energy dissipation operate to a lesser degree owing to reduction of the duration of heating and cooling periods. Therefore absence of traces of melting and plastic deformation in the surface layers of specimen 1 may be associated with formation of a highly supersaturated oxygen solution in the steel, with an oxygen concentration of around 10 percent. Solutions with such an oxygen concentration are thermodynamically unstable in the presence of ordinary heating. However, under friction conditions far from equilibrium, formation of dissipative structures is possible [9]; these structures are a mechanism of adaptation to the friction conditions in the given system.

In accordance with the general Le Chatelier-Brown principle, formation of highly supersaturated solid solutions weakens the results of external effects, protecting the material from intensive breakdown. A large quantity of energy is necessary for formation of such solutions, and their entropy decreases in comparison with equiponderant structures of the same temperature consisting of the same components. Consequently conditions of applicability of Klimontovich's S-theorem [10] are observed, and processes of self-organization occur in the system, coupled with formation of dissipative structures. This in turn promotes wear reduction, since it was established in [11] that if secondary structures are dissipative, then under otherwise equal conditions their wear intensity would decrease.

The results of experimental research on metal-metal friction pairs at a low coefficient of mutual overlap indicate that chemical factors have a significant influence on contact interaction at high sliding velocities.

Symbols

p —pressure of gases in working chamber; v —sliding velocity; p_a —calculated normal pressure; f —coefficient of friction; p_d —dynamic nominal pressure; $f p_d v$ —realized friction power; $p_a v$ —prescribed unit friction power.

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Specialized Automatic Presses for Making Small Parts

947F0197A Moscow

KUZNECHNO-SHTAMPOVOCHNOYE

PROIZVODSTVO in Russian No 6, 1994 pp 19-22

[Article by V. G. Shipinskiy and V. N. Luzay; UDC 621.979.06]

[FBIS Abstract] The article briefly describes some automatic sheet stamping presses developed by "Tekhnopribor" Special Design and Technological Office (Gomel) for making small parts. These presses are highly productive, accurate and reliable with simplified design, low energy requirements, small in mass and overall dimensions. They are being developed by upgrading existing models and looking for new engineering approaches. The base models for development are low-drive crank-pitman presses with bidirectional push-pull material feed. Most promising in this class is the model BPA series with floating die blocks in a force range of 25-100 kN, drive powers of 5-10 kw and masses from 750 to 2000 kg. The authors give a detailed description of the design. Figures 2, table 1, references 6.

MECHANICS OF GASES, LIQUIDS, AND SOLIDS

Acquisition of Fuel Gases for Metallurgy, Chemistry and Thermal Power Engineering

947F0187A Moscow METALLY in Russian No 3, May-Jun 94 pp 3-13

[Article by V. V. Mechev; UDC 662.99]

[FBIS Translated Text] The results of experimental industrial research on acquisition of fuel gases by processing garbage and coal in a slag melt tank are presented. Ideas on a general program to restructure thermal power engineering and specific proposals on procedures and apparatus for high-volume acquisition of fuel gases are suggested.

All known means of burning coal in boiler furnaces and at electric power plants do not permit comprehensive use of coal components, and are not ecologically acceptable.

In the traditional method of burning coal at the country's electric power plants, 18-25 percent of unburned carbon remains in fly ash. This carbon exists in the form of coke slagged by the ash component.

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Each year over 115 million tonnes of fly ash are formed in Russia, occupying close to 250,000 hectares of land suitable for agricultural and productive activity. Water draining through the soil at locations of ash and slag dumps clogs rivers, lakes, and town wells, and at wind velocities above 8 m/sec the concentration of ash particles in the atmosphere exceeds the public health norms by several times.

Gas releases are especially harmful. Thermal power engineering is one of the sectors that significantly pollutes the environment. Of the total volume of harmful atmospheric exhausts, thermal power engineering is responsible for approximately 27 percent. The smoke gases of thermal electric power plants contain from 450 to 1,200 mg/nm³ of nitric oxides (the public health norm is 230 mg/nm³) and from 800 to 1,500 mg/nm³ of sulfuric oxides after purification. All of this leads to sharply higher rainfall; the thermal effect over the planet (due to CO₂) grows more intense each year.

The world economy is restructuring its fuel and energy complex with an orientation on developing nuclear power engineering, gasifying coal, and making all-out use of renewable energy resources—wind, solar energy, biomass.

In this case ecologically clean production procedures are fundamental to the choice of directions to follow. Unfortunately this reorientation is proceeding extremely slowly in Russia.

Dozens of coal gasification plants are now working in the world. In our country there were over 350 gas generators in 1958, producing approximately 35 billion m³ of gases of different kinds from coal. Now only a few mothballed installations remain. And in the meantime our country's future appears to lie in preferential development of the gasification of coal (chiefly Kansk-Achinsk coal) and improvement of nuclear power engineering. This will make it possible to solve ecological problems and improve the economy.

Thus, the efficiency of converting the heat of combustion of coal into electric energy when it is burned in electric power plant furnaces is approximately 0.4, while utilization of hydrogen-containing fuel obtained from gasification makes an efficiency of approximately 0.5 and higher possible.

Coal gasification followed by combustion of purified gases in turbines has a large number of other advantages, with the possibility for burning gas using a procedure that significantly reduces toxic releases into the atmosphere being foremost among them.

However, all existing types of gas generators, which impose high requirements on coal preparation prior to gasification, do not solve the problem of salvaging the ash and utilizing carbon dioxide, and their indicators are relatively low per unit output of the machine units.

The Koppers-Tottsek [transliteration] gasification process, which is the most intensive and which makes use of industrial oxygen, does not permit acquisition of a product of prescribed properties from ash, and it is distinguished by high demands upon fuel quality—moisture content, granulometric composition etc.

Interest is being generated by a development of Reynbraun AG [transliteration], Siemens AG and others, which have created a procedure for processing brown coal in a fluidized bed under pressure at a power of 600 mW [1].

The method is based on combination (a gas-and-steam turbine process), which is widely used in practice. The scheme is based on Winkler apparatus—a KS [not further identified] furnace for coal gasification under pressure using oxygen-enriched air (the VTV [not further identified] method). The method makes it possible to use any fuel characterized by a high rate of gasification due to higher pressure (p_{10-130^5} Pa), by absence of ethers and oils in the gases, etc. Electric energy is obtained by the use of vapor from boilers burning gasification gases and from combustion of synthesis gas in a gas turbine.

The shortcomings of this method include the need for careful preparation of coal, and the impossibility of recycling ash and CO₂. Nonetheless an industrial installation has been erected in Finland (Oulu), and 10-year plans for introducing this method into power engineering have been drawn up.

Work is also being done in our country on various methods of coal gasification. Mention should be made of the great possibilities of the steam-oxygen gasification method.

Use of oxygen is known to thermal power engineering. However, its use is not great except in steam-oxygen gasification. And in the meantime it is precisely by means of oxygen that a fundamental revolution can be made in thermal power engineering, because:

- use of oxygen for combustion makes it possible to reduce the volume of gases released into the atmosphere by a factor of four;
- high-temperature combustion is ensured even of low-grade hydrocarbon raw materials;
- the problem of obtaining gases with a high concentration of CO₂—up to 90-70 percent in theory—is solved, making comprehensive use of carbon dioxide for various purposes possible;
- acquisition of large quantities of nitrogen, which will find wide use in food industry for food storage, metallurgy, oil extraction, firefighting and so on, in addition to its use in chemical production operations, is provided for;
- acquisition of slag from ash produced by solid fuel combustion that is suitable for production of rock wool, cement, expanded clay aggregate etc. is possible;
- releases of nitric oxides are eliminated completely;

- iron and other metals (germanium, zinc, gallium etc.) can be extracted from coal ash.

Use of oxygen makes it possible to reduce the volume of equipment at thermal electric power plants by several times. Paradoxical as it may seem, the concentration of the oxygen used must be 95 percent, or something close that, if we intend to produce a technological and an economic impact. Justified solution of this problem requires boiler furnaces and gasification devices of new design.

Methods and devices for so-called autogenic processes—processes in which the thermal balance is maintained by combustion of metal sulfides—have been under development in metallurgy for a number of years. All of Russia's copper, lead, and lead-zinc industry is currently converting to these processes. Our country's developments in this area exceed world developments in technical level and scientific support, as is evidenced in particular by purchases of licenses by Western metallurgical firms. These procedures are summarized by the authors of [2].

The great interest in these processes is explained not only by economic advantages but also by the possibility of comprehensive use of the raw material, and ecology. Experience accumulated by metallurgists in this area may be useful in thermal power engineering, municipal management and chemistry.

In 1986-1991 the author and his associates developed, and took as far as experimental industrial tests, processes for burning unprepared coal¹ and treating garbage in a slag tank through which oxygen-containing gas is bubbled² [3-6].

The new coal burning method essentially entails creating a gas-liquid suspension in the slag zone (the slag is obtained by melting the ash), into which unprepared coal with 0-200 mm particle size is fed. Oxygen or oxygen-enriched air is used as the gas fed into the melt. The gas is fed in from the side and from above.

Upon reaching the surface of the melt in the fuel combustion unit, the coal instantaneously undergoes decrepitation in the melt, the carbon part of the fuel burns in the vicinity of the lance, and the ash is assimilated by the melt. The process occurs during intensive mixing.

Combustion and gasification were carried out both with pure industrial oxygen and with blast that is oxygen-enriched to ≥ 40 percent. Unprepared garbage was also burned in slag melt using oxygen-containing blast.

Use of slag melt through which oxygen is bubbled to burn coal and garbage (furnaces of different designs may be used for this purpose) makes it possible to realistically raise the issue of large-scale production of fuel gases for various purposes (including hydrogen). Research being developed abroad on processing organic raw materials in an iron melt tank [7] and in an oxygen jet along the lines

of the Koppers-Tottsek presses [8] enjoys good prospects, but these processes are significantly inferior to Russian developments in terms of the demands placed on the raw material and the number of indicators. In fact, the range of raw materials that may be processed in a slag tank is extremely broad—from unprepared garbage (with a moisture content of 0-70 percent) to fly-ash brown coal (with 0-200 mm particle size). Animal wastes, biomass, wood shavings, coal enriching wastes and other materials can be processed in a slag tank by varying the blast oxygen concentration from 30 to 100 percent. In this case the composition of the gas phase can be regulated up to the point of acquisition of rich reducing gases.

A jet-bubbling [9] and a combined [10] method of delivering blast and materials into the melt proposed by the author for processing polymetallic raw material in nonferrous metallurgy may be especially productive. These methods make it possible to deliver and process materials of any particle size and moisture content in melt, and they permit establishment of a controllable atmosphere—from strongly oxidizing to strongly reducing—both in melt and in the gas phase.

Figure 1 shows some possible variants of obtaining fuel gases in an oxygen-blast slag-bubbling furnace accepting:

- a) dry coal dust through lances immersed in the melt, jointly with oxygen;

- b) chunk fuel of varying moisture content and particle size, delivered to the surface of the melt tank;

- c) dry coal dust delivered through lances together with an oxygen blast, and from above, chunk coal (peat, bitumen, wood, wood shavings, garbage, biomass etc.);

- d) steam together with oxygen delivered through lances immersed in the melt; in this case the steam-oxygen mixture is processed with coal dust delivered through lances not immersed in the melt;

- e) coal dust delivered through lances immersed in the melt, in which case the gases are processed by reducing gases above the melt.

Methods b, d were perfected in experimental industrial conditions, while the rest were tested in the laboratory.

Methods a-c basically produce gas containing carbon monoxide and up to 3-6 percent carbon dioxide. These methods may be used to obtain fuel gases. Methods d, e are usable for thermal power engineering (the gas contains up to 50-60 percent or more hydrogen). Method e foresees processing the gas with enriched dolomite powder (and, possibly, unenriched dolomite if the temperature above the melt is maintained at approximately 1,300-1,400°C) to remove sulfur. The calculated indicators for gasification in a furnace containing Kansk-Achinsk coal melt are presented in Figure 2.

The combination of procedures in which unprepared garbage is delivered to the surface of the melt and

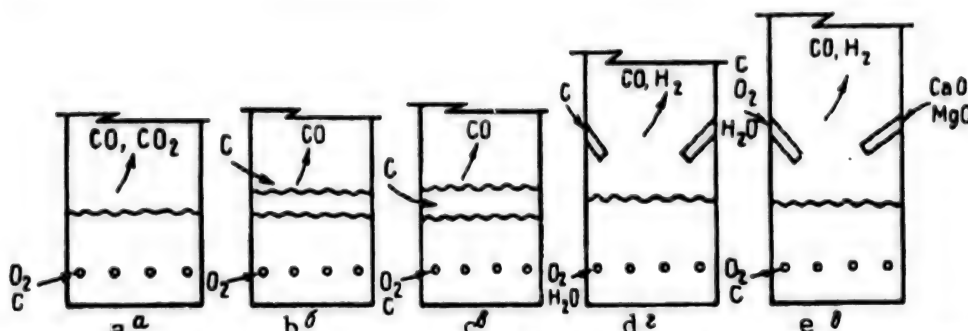


Figure 1. Diagrams Showing Delivery of Oxygen, Steam and Coal in Different Variants of Gasification in a Furnace Containing Slag Melt

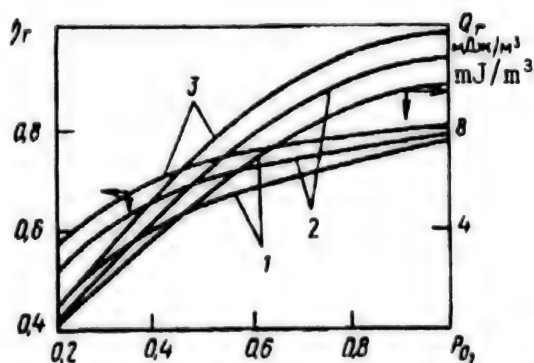


Figure 2. Calculations of Gasification Efficiency η_r and Heat of Combustion of Gasification Products as Related to the Degree of Blast Enrichment by Oxygen P_{O_2} , and in Relation to Change in Moisture Content W of Coal From the Kansk-Achinsk Fuel and Energy Complex, / : 1—33; 2—20; 3—6

processed, and gases are processed with coal dust above the melt, is especially interesting from a technological and economic point of view. This may be done as shown in method d.

Table 1 shows the material balance of combustion of garbage in a slag tank, carried out in an experimental industrial furnace [3-6]. The high concentration of steam in these gases may be noted.

When gas of similar composition was processed with coal dust in the laboratory, we obtained gases containing 30-32 percent H_2 and 20-30 percent CO . This process may be carried out (Figure 3) using a Vanyukov furnace developed for nonferrous metallurgy, with practically no changes in design, or a fuming furnace.

The latter is cheaper, because it is made out of ferrous metals. It should be noted that in a reducing atmosphere, ferrous metal caissons are generally not inferior to copper caissons in durability. This makes the furnace almost an order of magnitude cheaper, and makes it possible to manufacture it out of caissons supporting

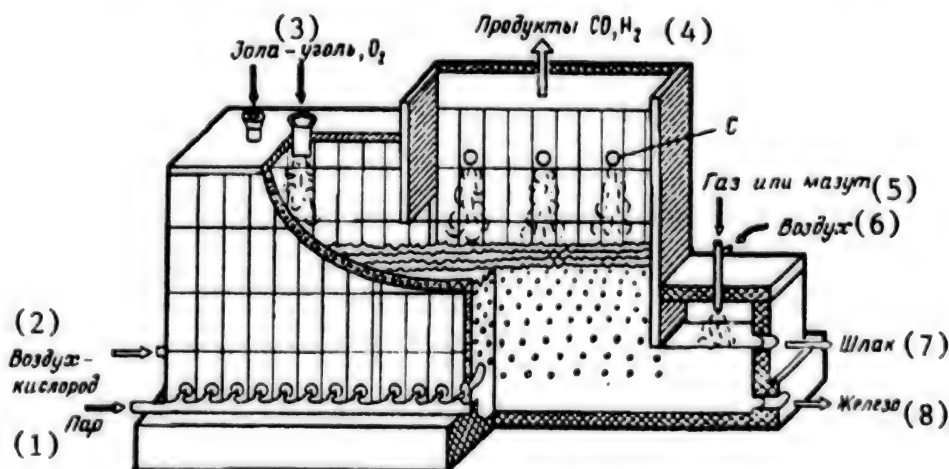


Figure 3. Caissoned Slag Melt Furnace for Coal Gasification

Key: 1—Steam; 2—Air-oxygen; 3—Ash-coal, O_2 ; 4—Products, CO, H_2 ; 5—Gas or fuel oil; 6—Air; 7—Slag; 8—Iron

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Table 1. Some Indicators for Garbage Processing in Slag Melt

(1) Вариант	(2) Производи- тельность по сухому, т/ч	(3) Количество воды		(5) Количество дутья при $\alpha = 1,1$, м ³ /ч	(6) Расход, м ³ /ч		(9) Содержание O ₂ в дутье, %	(10) Количество O ₂ в дутье при $\alpha = 1$, м ³ /ч	(11) Количество отходя- щих газов при $\alpha = 1,1$, м ³ /ч
		(4) т/ч	%		(7) техниче- ского O ₂	(8) воздуха			
1	6,762	7,238	51,7	8 841	5776	3 065	70,0	5626	21 373
2	6,762	7,238	51,7	11 590	5007	6 583	53,4	5626	24 122
3	6,762	7,238	51,7	17 303	4383	12 920	40,0	6292	30 168

Вариант	(12) Состав газа, об. %				(13) Содержание вредных примесей, об. %							
	CO ₂	O ₂	N ₂	H ₂ O	(14) антрацен		(17) пирен		(18) бензопирен		(19) окислы азота	
					(15) замер	(16) ПДК	замер	ПДК	замер	ПДК	замер	ПДК
1	23,5	2,6	12,7	61,15	(0,5—3) · 10 ⁻¹⁴	1 · 10 ⁻¹¹	(0,4—2) · 10 ⁻¹⁴	3 · 10 ⁻¹⁰	(0,1—3) · 10 ⁻¹³	1 · 10 ⁻⁴	(5—6) · 10 ⁻²	8,5 · 10 ⁻²
2	20,8	2,36	22,6	54,2								
3	17,7	2,1	34,6	45,57								

Key: 1—Variant; 2—Productivity, Dry Weight, tonnes/hr; 3—Quantity of Water; 4—tonnes/hr; 5—Blast Quantity When $\alpha=1.1$, m³/hr; 6—Consumption, m³/hr; 7—Industrial O₂; 8—Air; 9—Blast O₂ Concentration, Percent; 10—Quantity of O₂ in Blast When $\alpha=1$, m³/hr; 11—Quantity of Exhaust Gases When $\alpha=1.1$, m³/hr; 12—Gas Composition, % by volume; 13—Concentration of Toxic Impurities, % by volume; 14—Anthracene; 15—Measured; 16—Maximum Permissible Concentrations; 17—Pyrene; 18—Benzopyrene; 19—Nitric Oxides

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attainment of the required steam energy parameters.³ In this design, the furnace must be organically linked to the boiler and steam generator.

In the case of processing garbage, when the gas that is obtained contains up to 50-60 percent moisture, large quantities of fuel gas may be obtained. A furnace of moderate dimensions (approximately 30-35 m² hearth area) is capable of producing up to 50,000-60,000 m³/hr of fuel gas, and more. Gases in which the concentration of toxic components did not exceed the maximum permissible concentrations adopted in Russia were obtained by processing garbage (consisting of plastics, paint cans, animal bones and wastes, rotting vegetables, rubber etc.) (Table 1). Nonetheless, processing of such gases with coal

dust completely eliminates the possibility of reuse of the most toxic xenobiotic—dioxin. Formation of hydrogen promotes bonding of Cl and F to thermodynamically stable compounds, which are easily trapped by scrubbing the hot gases—something that has been done in industry for decades.

This procedure may be used to process wood wastes, biomass and so on, in addition to garbage.

Gasification of just coal by methods a and b (see Figure 1) permits acquisition of gases containing CO and H₂. The material balance of one of the stages is shown in Table 2.

Table 2. Material Balance for Gasification of Moscow Brown Coal in an Experimental Industrial Unit

Loaded	Quantity		Obtained	Quantity	
	tonnes	%		tonnes	%
Coal	30	35.7	Carbon monoxide	49.4	58.8
Oxygen	36.4	43.3	Carbon dioxide	4.54	5.4
Nitrogen	17.6	21	Nitrogen	17.94	21.4
			Slag	7.9	9.55
			Hydrogen	0.55	0.65
			Dust	0.65	0.75
			Error	3.02	3.45
Total	84	100	Total	84	100

Energy acquisition in the proposed methods may be predicted from the expenditure side of the thermal balance of gasification, percent:

Physical heat of gases	14-16
Chemical heat of gases	70-74
Heat of slag and metal	5-7
Heat from cooling water	6-7

We can see that the bulk of the energy is contained in hot gases in the form of chemical energy. The physical heat of the gases is recycled in steam generators to obtain steam with high parameters that is then fed into the steam turbine. Heat from cooling water may be used in heating systems, or upon conversion of furnaces to evaporative cooling, to acquire high-parameter steam.

As was noted above, owing to the reducing atmosphere and the high temperatures of these processes, metals contained in ash, including iron, are reduced from oxides, and transform into melt. Inasmuch as the melt yield is low, it would be irrational to try to salvage its heat. The heat of slag may be salvaged by its aerial or

hydraulic granulation to obtain air heated to approximately 400-500°C, or low-potential steam, which may also be used for heating purposes. Use of industrial oxygen (95-96 percent O₂) in gasification processes solves a number of ecological and engineering problems.

Besides the advantages noted above of using industrial oxygen in gasification, the following may also be noted: a higher hydrogen concentration and a lower CO₂ concentration due to the high temperatures; complete decomposition of tars. In addition the need for catalysts disappears.

When comparing methods of coal gasification (tables 3 and 4), it would be worthwhile focusing attention separately on the use of the fuel gases obtained in thermal power engineering. Their combustion in procedures calling for combustion of natural gas in an air blast already produces substantial economic and ecological impacts. However, in this case the problem of salvaging the CO₂ isn't solved, and the exhaust gases will contain nitric oxides and unburned carbon monoxide, though in amounts below the maximum permissible concentrations.

Table 3. Indicators for Coal Gasification by Different Methods

Indicator	Gasification Method				
	Lurgi		VTV	Koppers-Tottsek	Furnace and Melt
Layer	Motionless	Fluidized	Fluidized	Suspended	Bubbled, containing slag melt
Nature of movement of fuel and gas	Countercurrent	Parallel-current	Parallel-current	Parallel-current	Countercurrent
Ash removal method	Dry	Dry	Dry	Liquid-melt	Liquid-Melt
Time of presence of fuel, sec	15	3.5	3-3.5	1-3	3-5
Gasification intensity, kcal/(m ² ·r)	70 ⁵ -1.30 ⁶	2.10 ⁵ -20 ⁶	10 ⁵ -20 ⁶	8.50 ⁵ -40 ⁶	50 ⁵ -10 ⁶
Productivity with respect to dry gas, tonnes ³ /hr	50-75	75-100	60	20-50	20-60
As above, with respect to coal, tonnes/hr	17-40	85-50	50-80	10-50	70-80
Grain size, mm	5-50	0.8-10	0.5-3	0.1-1	0.1-200
Coking quality	Noncoking	Noncoking	All	All	All
Gasification pressure, atm	2-3.5	0.1-1.3	1.3	0.1-0.3	0.1-0.5
Temperature in layer, °C	750-1100	1100	900	1300-1800	1300-1800
O ₂ consumption, m ³ /1000 m ³	160-250	250-350	-	380-450	400-500
Coal consumption, kg/1000 m ³	650-1000	600-750	-	560-750	500-600
O ₂ /H ₂ O ratio	from 1:5 to 1:9	from 1:1 to 1:2.5	-	1-0.12	-

Table 4. Composition Indicators for Industrial Solid Fuel Gasification Processes

Process	Form of Gasification	Fuel	Blast	Gas Composition, % by volume				
				CO ₂	CO	H ₂	CH ₄	H ₂ O
Winkler	In fluidized layer	Brown coal or brown-coal coke	Steam-oxygen mixture	25	33	40	1	1
Lurgi, under pressure	In solid layer	Brown or bituminous coal	As above	33	13	35	17	2
Koppers-Tottsek	In suspended state	Bituminous coal	As above	13	51	34	0	2
In masonry furnaces	In solid layer	Brown coal briquettes	Water vapor	12	29	56	2	1
Koppers-Tottsek (gas heat-transfer agent)	As above	As above	Mixture of circulating CO ₂ and H ₂ O gas	12	29	57	1	1
Variant 1	In melt	Coal, peat, coke	Oxygen	-	-	-	-	-
Variant 2	As above	Coal, peat, garbage, plant raw materials	As above	5-30	30-40	30-50	2	1-2
Variant 3	As above	As above	Air enriched with O ₂ to 40%, steam	Acquisition of synthesis gas is possible				

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The problem may be solved by burning the gas in industrially pure oxygen. In this case CO_2 and H_2O are formed. Inasmuch as high temperatures are attained in this case, to stabilize these compounds, economize on fuel and organize sensible heat exchange, the furnace should be designed in such a way as to accommodate recirculation of gases, as was done in the past, and is still being done today at some operating thermal electric power plants [8]. Fuel gases mixed with exhaust gases may be burned in turbines or in steam generators.

Exhaust gases containing high CO_2 concentrations may be used for the following purposes after the heat is salvaged: for injection of oil wells [11], in food industry, to heat greenhouses, to grow biomass in water basins, and to produce methanol out of natural gas; part of the carbon dioxide may be liquefied.

The outlays to obtain large volumes of oxygen will be compensated by the positive economic and industrial impacts. Thus, given relative electric power consumption of approximately 0.35 kW/m^3 oxygen in a KT-70 plant, and given consumption of 325 gm of coal to obtain 1 kW of electric energy, the amount of carbon that would have to be burned to obtain $70,000 \text{ m}^3$ of oxygen per hour [12] would be $70 \times 10^3 \times 0.35 \times 0.325 / 1000 = 4.9$ tonnes. The energy outlays on oxygen production should be approximately 11-12 percent of the plant's output. Considering that from 10 to 25 percent of the coal is lost with ash in modern electric power plants, while from 5 to 20 percent is lost at gas plants, this suggestion doesn't look all that fantastic.

The sharp decrease in metal content of equipment because of the decrease in dimensions of the furnace itself and of the gas scrubbing units should be considered in this case. Thus, the dimensions of the furnace may be reduced by approximately three times while passing as much oxygen through them as when working with an air blast.

The objective of complete removal of CO_2 becomes realistic, for example cryogenically (the liquefaction point is 52°C).

Nonetheless in regions where there is little carbon fuel or where its quality is low, economization of this fuel during gasification remains an urgent task. In regions where nuclear power plants already exist or where their construction is possible, combining the nuclear reactor with helium heat-transfer agents to obtain steam and a slag melt furnace might be a very interesting variant (Figure 4). Delivery of steam to the furnace together with oxygen will make it possible to economize on the lion's share of the carbon raw material consumed in the thermal processes of gasification. In this case there would be no need for the considerable outlays of reequipping the reactors in order to raise the temperature of the heat-transfer agent to $1100\text{--}1200^\circ\text{C}$. All the more so because this will be associated with considerable technical difficulties [13]. It is easy to heat steam from the reactor (with $t \approx 800^\circ\text{C}$) to a higher temperature in the melt furnace.

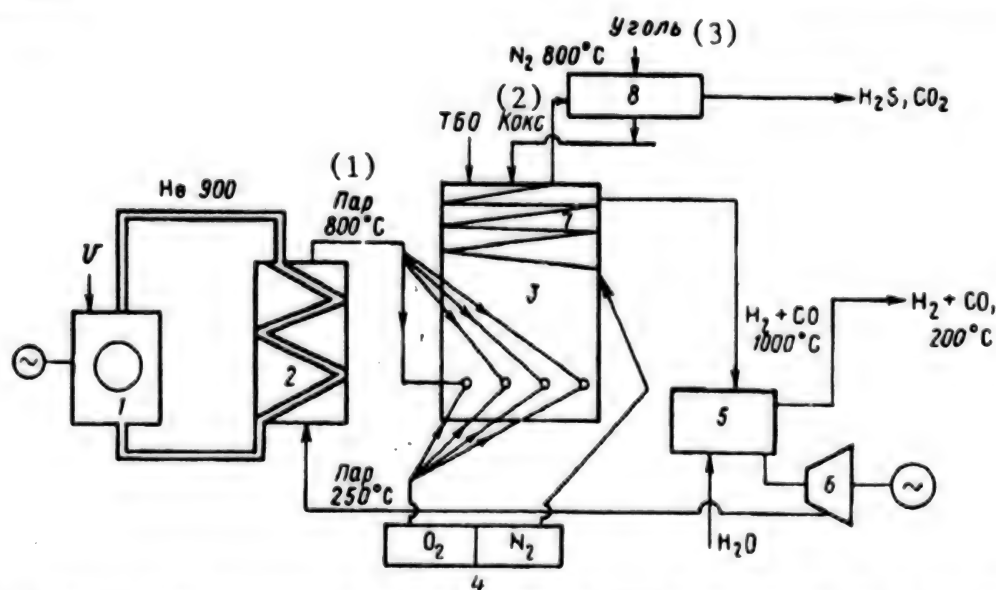


Figure 4. A Variant of the Layout of a Nuclear Reactor With a Furnace for Coal Gasification and for Processing Garbage in Slag Melt: 1—nuclear reactor with helium loop; 2—heat exchanger; 3—gasification furnace; 4—oxygen station; 5—steam generator; 6—steam turbine; 7—heat exchanger for nitrogen heating; 8—reactor for heat treatment of coal with hot nitrogen

Key: 1—Steam; 2—Coke; 3—Coal

Processing a highly concentrated water-coal suspension in the proposed unit may be an extremely interesting variant.

Construction of pipelines along the Trans-Siberian Railroad for centralized delivery of pulverized coal from the Kansk-Achinsk basin by hydraulic transport to gas plants built near large industrial centers will make it possible to significantly reduce the load on rail transportation. Such gas plants, when combined with thermal electric power plants, hot-water boilers and industrial enterprises, could deliver their surplus electric energy to central Russia while satisfying ecological norms. In this case it would become possible to reduce consumption of oil and gas, and with time, to make a full transition to coal as fuel and to energy from nuclear power plants, and in the even more remote future, to processing biomass in place of coal.

Use of nitrogen obtained as a byproduct from oxygen plants deserves separate attention. Such nitrogen may be used in oil extraction, firefighting, organization of safe oil transfer, in refrigerators and food warehouses, and in chemistry and metallurgy. Mention should also be made of increased acquisition of inert gases from oxygen units, which raises the economy of oxygen plants.

The flexibility and universality of the proposed processes and apparatus for organic fuel gasification and garbage processing permit their successful incorporation into the infrastructure of large and small cities and industrial centers.

The proposed procedures may be of special significance to locales remote from populated places.

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Footnotes

1. TPP-210 boiler at the Kharkovskaya TETs-2 is presently being reequipped with a melt furnace.
2. A plant processing garbage according to the proposed procedure is being planned in Moscow Oblast.
3. The first experimental furnace in Norilsk was made out of steel caissons.

Numerical Simulation of Gasdynamic Processes During Catastrophic Volcanic Eruptions

947F0189A Minsk INZHENERNO-FIZICHESKIY
ZHURNAL in Russian Vol 66 No 3, Mar94
(manuscript received 15 Jul 92) pp 263-266

[FBIS Abstract] Catastrophic volcano eruptions are rare, those with an energy of 25 gigaton TNT equivalent (Tambora in 1815) estimated to occur once in 10,000 years and those with an energy of 100-1000 megaton TNT equivalent (Krakatau in 1883) estimated to occur once in 100 years, but the processes attending their evolution are of interest. Those more frequent weaker ones are analyzed by the method of numerical simulation based on the applicable equations of gas dynamics for the simplest possible model: an axisymmetric eruption geometry and an entire eruption energy initially contained in a gas as heat, this gas at a temperature T and under a pressure P occupying a hemispherical shell of radius R based on the surface of the Earth. Data on Krakatau's eruption yield, for gas with thermodynamic characteristics close to those of air: $T = 1400^\circ\text{C}$, $P = 420$ atm, and $R = 4.8$ km, ashes rising 50 miles high and dust

rising 50 miles high. Calculations are made by the method of large particles in a cylindrical system of coordinates, with the initial condition of an atmosphere at a hydrostatic equilibrium prior to eruption. The equations of eruption gas dynamics are solved first for an ideal isothermal atmosphere and then for a nonideal one, in the latter case by iterations and in both cases with the aid of appropriately defined boundary conditions at the surface of the earth. Such calculations have been made for successive instants of time up to 7.5 min after the beginning of eruption. During the initial stage of eruption a large mass of dense air ascends from the ground to appreciable heights, where it expands and quickly cools down before descending back to earth at a high velocity of up to 1 km/s. Attendant collision with the denser air below generates a strong shock wave which propagates upward and heats up the cooler air. This oscillatory movement of air masses continues for several cycles with a successively smaller amplitude. Figures 3; references 8.

Numerical Simulation of Light-Induced Convection and Thermal-Optical Interaction of Vertical Radiation Beam With Fluid

947F0191A Minsk INZHENERNO-FIZICHESKIY
ZHURNAL in Russian Vol 66 No 5, May 94
pp 547-555

[Article by N.Ye. Galich, V.A. Petrushchenkov, St. Petersburg State Engineering University; UDC 535.2:621.378.8]

[FBIS Abstract] The light-induced convection due to the medium heating by absorbed radiation energy and the resulting thermal self-defocusing are discussed, and an attempt is made to obtain a numerical solution of the joint system of convection equations in Boussinesq's approximation and a solution of the light propagation problem in a small-angle (quasioptical) approximation for the purpose of analyzing both the steady-state and transient phases of the thermal-optical beam interaction with fluids, obtaining and substantiating a number of correlations, and explaining the origin and cause of the phenomena observed experimentally. The numerical simulation is limited to laminar convection conditions. To this end, an axisymmetric light-induced flow in a vertical cylinder with a finite height is considered. An analysis shows that incorporation of the radiation self-defocusing changes the characteristic features of light-induced convection and beam divergence in the transient and steady-state phases of thermal-optical interaction, both quantitatively and qualitatively, compared to the specified intensity approximation, which is especially noticeable for the beam divergence and fluid temperature on the beam axis. This thermal self-defocusing noticeably delays the convection settling time. It is shown that the effect of the temperature and velocity boundary conditions on the horizontal boundary segment is smoothed at a distance on the order of the cell diameter, and has virtually no effect on the dependence of the velocity, temperature, and beam

divergence on the radiating power. The authors are grateful to V.I. Zuyev for discussing the experiments and providing data. Figures 1; tables 2; references 19: 11 Russian, 8 Western.

Mass Transfer During Filtering of Corrosive Component-Containing Waters

947F0191B Minsk INZHENERNO-FIZICHESKIY
ZHURNAL in Russian Vol 66 No 5, May 94
pp 580-584

[Article by M.G. Khranchenkov, Scientific Research Institute of Mathematics and Mechanics at the Kazan University; UDC 532.546]

[FBIS Abstract] The effect of various factors on the chemical composition equilibrium of groundwater which reflects the equilibrium in the water-rock system, particularly the case where a change in this equilibrium is due to the effect of corrosive groundwater components on the rock, e.g., CO_2 , O_2 , H_2SO_4 , etc., resulting in dissolution of the rock body, is considered, and a mathematical model is developed for describing the mass transfer during the dissolution and filtering of corrosive component-containing waters. The corrosive component and reaction product transport equations are derived. The model is compared to A.V. Lekhov's well-known model, and it is demonstrated that while Lekhov's model ignores the diffusion phase of the dissolution process, the new model describes this phase, i.e., it is assumed that a thermodynamic equilibrium is settled almost instantaneously on the phase boundary of the physically elementary volume. New model's applications to the karst formation process are discussed. The author is grateful to A.V. Kosterin, A.G. Yegorov, and A.M. Nikolayev for constructive discussions and assistance. Figures 1; references 10.

Dependence of Spatial and Polarization Characteristics of Radiation Flux Reflected by Composite Materials on Polarization Plane Azimuth of Incident Radiation

947F0190A Minsk INZHENERNO-FIZICHESKIY
ZHURNAL in Russian Vol 66 No 3, Mar 94
(manuscript received 8 Jul 92) pp 442-447

[Article by V.A. Dlugunovich, Ye.A. Kruplevich, and V.N. Snopko, Institute of Physics imeni B.N. Stepanov at Belarusian Academy of Sciences, Minsk; UDC 535.361.2:535.518]

[FBIS Abstract] An experimental study was made concerning reflection of polarized light by composite materials consisting of an organic binder and a heat-resistant filler: textolite, glass-textolite, and micarta. All three are being used as structural materials and as coatings for protection of other materials against heat. They were

tested at room temperature in the partly transparent initial state, after surface roughening by treatment with abrasive cloth, and after formation of a carbonized surface layer by heat treatment with a CO_2 -laser (glass-textolite also after that surface layer had burned down exposing the glass fibers). The tests were performed with an He-Ne laser, its $0.63 \mu\text{m}$ light having been polarized prior to incidence on the surface. The object of the experiment was to determine how the spatial intensity distribution and not only the percentage polarization of the reflected light but also the orientation of its polarization plane depend on the orientation (azimuth) of the polarization plane of the incident light. Measurements were made with a goniometer subtending a solid angle of 0.00015 srad for recording the intensity ellipsoid of reflected light or 0.0037 srad for determining its percentage polarization and the azimuth of its polarization plane, with a 0.25° or 5° angular resolution respectively. The incident light beam was oriented normally to the surface and the reflected light was scanned in one observation plane only, with the polarization plane of the incident light oriented successively at 0° , 45° , and 90° angles relative to the observation plane. In a separate test for specular reflection the angle of incidence was varied over the $5\text{--}85^\circ$ range. The goniometer was picking up all the reflected light for measurement of the intensity ellipsoid, whereupon its polarized fraction was measured and then extracted for analysis by rotation of its plane. The results indicate that roughening the surface rougher surface enhances depolarization of all the light scattered and carbonizing the surface abates that depolarization. The results are interpreted in terms of single and multiple scattering of light not only by the surface but also by internal microinhomogeneities. Light scattered by internal microinhomogeneities, once only, becomes partly polarized as it emerges from the material into the air and rotates the preferential polarization plane in the direction opposite to that of light reflected by the surface. Not only the polarization but also the spatial intensity distribution of light reflected by these composite materials change upon laser treatment, which changes their refraction index and thus the quantitative relation between light scattered by their surface and light scattered by their internal microinhomogeneities. Figures 3; references 6.

Thermal Conductivity of Composite Material Reinforced With Regular Array of Spheroidal Particles

947F0190B Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol 66 No 3, Mar 94 (manuscript received 15 Apr 93) pp 497-504

Article by V.I. Kushch, Institute of Superhard Materials at Ukrainian Academy of Sciences, Kiev; UDC 536.248]

[FBIS Abstract] The thermal conductivity of composite materials is considered, one with an isotropic matrix and an array of reinforcing prolate spheroidal filler particles. The test of its effective thermal conductivity is evaluated following a rigorous analytical solution of the three-dimensional boundary-value problem of heat conduction for a medium with a periodic lattice of such inclusions transmitting a constant heat flux. The problem is formulated in a three-dimensional orthogonal Cartesian system of coordinates x,y,z with its origin O at the center of any one inclusion, with correspondingly three different lattice periods $a_{x,y,z}$ and with the major semiaxes p_z of all inclusions oriented in the Oz direction of heat flow. For solution of this problem is introduced an auxiliary system of coordinates, a prolate spheroidal one with the origin at the origin of the Cartesian one. The temperature field within the composite material satisfies the Laplace equation $\Delta T = 0$, the temperature being a quasi-periodic function of the coordinates. In addition to periodicity is also stipulated ideal thermal contact between matrix and inclusions. The problem is reduced to the problem for a composite layer of a thickness equal to one a_z period and thus containing an only two-dimensional inclusion lattice, the solution to this problem being sought in terms of bi-periodic harmonic functions and then extended to a composite with a cubic inclusion lattice. A numerical evaluation made on an IBM AT-286/287 computer indicates how the thermal conductivity of such a composite material and each of the three diagonal tensor components depend on the filler characteristics: 1. volume fraction of inclusions (varied from 0.1 to 0.5); 2. ratio of the length of their major semiaxis to the average length of their two shorter semiaxes (varied from 1.0 to 2.25); 3. ratios $p_{x,y,z}/a_{x,y,z}$ of the length of each semiaxis to the corresponding lattice period (all three ratios being equal in the ideal case); 4. center-to-center distance between inclusions; 5. ratio of thermal conductivity of the inclusion material to that of the matrix material (varied from $K=0$ characterizing a porous matrix alone to $K=1000$ characterizing a highly nonhomogeneous composite). Tables 3; references 12.

Tectonic Weapons: How Real the Prospect

947N0074A Moscow SCIENCE IN RUSSIA in English
No 4, Jul-Aug 94 pp 34-35

[Article by A.V. Nikolayev: "Earthquake Triggered by Underground Nuclear Explosions," *Vestnik Rossiiskoy Akademii Nauk*, Vol 63, No 2, 1993 (in Russian); Prepared by Yuri Kolesnikov]

[FBIS Transcribed Text] On June 28, 1992, a strong earthquake struck an area 150 km from Los Angeles, CA. A mere five days previous, the ground had been jolted by a nuclear explosion detonated in a shaft on the test site in Nevada. A similar span of five days separated the test explosion on an island of the Novaya Zemlya archipelago in the Arctic and the devastating earthquake in Spitak, Armenia, on December 7, 1987. Was it a coincidence or what? Or perhaps there is a direct cause-effect relationship between natural and man-made processes occurring in the planet's interior?

What is then the learned opinion on the problem? One widely recognized authority, A. Nikolayev, a Corresponding Member of the Russian Academy of Sciences, Director of the United Earth Physics Institute, dismisses outright what he claims is a stale idea that underground nuclear tests initiate remote earthquakes (Spitak lies 3,500 km away from Novaya Zemlya). Taking a closer look at the Spitak disaster, it is appropriate to recall the powerful earthquake a mere 600 km away across the border in Iran days before. Could it be that the Iranian quake triggered off the destructive shocks in Spitak? Guided by this sensation hunter's logic, one could suspect a more complicated relationship—first the nuclear explosion, then the quake in Iran, which set off the disaster in Spitak.

Seriously, these are sheer speculations, however, for facts suggest a different story. Indeed, light tremors, called aftershocks, are recorded from one to two months after an underground nuclear test some 20 to 30 km away, not the fantastic thousands of kilometers. Actually, the accumulated tectonic energy is released in these aftershocks, which are more intensive, therefore, in seismically active areas—in Nevada, for instance, which lies in a tectonically active region underground tests are trailed by stronger and more frequent aftershocks than is the case at the test site of Semipalatinsk in Kazakhstan.

Incidentally, this is the test site that has been subjected to the toughest analysis yet by Russian seismologists. They were to explore the effect of the Semipalatinsk tests on the frequency of earthquakes shaking the vast area extending west to east from the Caucasus to Western China, and south to north from 30° to 45°C.

Although Semipalatinsk lies well beyond this area, a small growth in seismic activity was detected here in the first ten days after the explosions. This pattern is characteristic of the vast area in question. And yet, its different parts exhibit a different sensitivity to the underground nuclear tests in Kazakhstan. The area

between the Pamir and Hindukush mountains is by far the most susceptible terrain where a 35 percent rise in seismicity has been detected. Powerful explosions evoked a distinct response in the Tien Shan and Pamir mountains. Western China and the Caucasus are relatively hard to be awakened by man-made tremors, while the Kopet-Dag and Zagros Mountains behave in a most peculiar way—rather than turning on, they lower their tectonic activity. To sum up, the observable effect varies from place to place.

Interestingly, the environs of Ghazli, a town in the Kyzyl-Kum Desert, within the area under study, suffered 11 fairly strong earthquakes in succession for a period of 15 days in the wake of nuclear explosions. The probability of this being a mere coincidence is very small indeed, about one in a thousand. Significantly, this seismically active area is located close to vast gas fields which have been intensively exploited since the mid-1960s. The ground here is, therefore, exposed to a double technogenic effect—a slow change in the strained state of the crust as gas is released from the Earth's interior and the seismic repercussions of nuclear explosions.

Underground tests, therefore, do affect the behavior of the interior. Then, each earthquake is an occasion to relieve elastic stresses in the lithosphere and, therefore, to let off the energy of an impending more powerful earthquake. Which means that the triggering effect of an underground explosion ties in with the natural process of stress mitigation. In this sense, explosions are useful as well as ecologically clean. More important, early release of tectonic energy by moderate or weak artificial jolts can help reduce the pinch of future powerful earthquakes.

With these considerations in mind, isn't it the time to appreciate, for instance, the 25-year "contribution" of the overtaxed Semipalatinsk test site to the seismicity of the nearby active region in the Tien Shan mountains? Hasn't it guarded Alma Ata against catastrophic earthquakes on a scale that hit the city in 1887 and 1911? This being presumably so, then the economic effect of nuclear tests can be assessed in terms of reduced losses from a strong earthquake. Indeed, with the power of an impending catastrophe reduced by a few percentage points, a victimized large city would be spared many billion rubles' worth of damage.

It is hard to tell whether nuclear charges would ever be used with this noble aim. Today, however, we could perhaps reflect on the prospects of the so-called tectonic weapons in this context.

Typically, its effect can be described in the following terms. Should a powerful potential of elastic energy accumulate in the shape of a deformed portion of the crust, it could be released by detonating a nuclear charge in its epicenter. The resulting destruction would be equal to that caused by a powerful nuclear bomb exploded over the area.

Actually the idea is preposterous through and through. First, you must find a place where a catastrophe earthquake is about to strike. Which means you must be able to predict it, a problem that continues to escape solution even by seismologists engaged in comprehensive geophysical observations all year round. To say nothing of the attacker who is not in possession of such information. Second, even if such a place is found and the exact date of the disaster established, it is a wild guess as to what would happen if the man-made jolt comes before the deadline set by nature. Most probably, the explosion would accelerate the maturing of

the earthquake, which would not come off immediately any way, so the effect of surprise, the key constituent of the formula for victory, would fade. Besides, catastrophic earthquakes are extremely rare on the Earth, so it would not be simple to adapt them to war ends.

To conclude, the tectonic weapon is most likely never to be. Instead, varying earthquake triggering techniques could, with the passage of time, be used to gradually relieve stresses in seismically hazardous areas and to reduce the risks of destructive natural disasters.

AGRICULTURAL SCIENCE

Effect of Krezacin on Growth, Development, and Productivity of Cotton Plants

947C0402 Moscow DOKLADY AKADEMII NAUK in Russian Vol 333 No 1, Nov 93 [manuscript submitted 22 Jun 93] pp 124-126

[Article by D. A. Khankhodzhayeva, Academician M. G. Boronkov, Irkutsk Institute of Organic Chemistry, Siberian Department, Russian Academy of Sciences; Tashkent State Agrarian University; UDC 631.811.982]

[FBIS Abstract] In an extension of earlier work in which a new growth stimulator was found for cotton—1-(chloromethyl)silatrane (mival)—the researchers here studied the effect produced on cotton by the biostimulator krezacin—2-methylphenoxyacetoxy tris(2-hydroxyethyl) ammonium. The tests were performed in the field in 1992 at the teaching farm of Tashkent Agricultural Institute on meadow soils. Tomentose cotton seeds were moistened with 0.02 percent aqueous solutions of krezacin and mival. The seeds treated with krezacin sprouted nine days after planting. Ninety percent of the krezacin-treated seeds sprouted four days earlier than control, whereas the mival-treated seeds sprouted only two days earlier than control. Krezacin also promoted a plant density that was more beneficial than that promoted by mival, as well as more cotton-bearing branches. In general, the krezacin increased the harvest by 2.5 centner/hectare (8.9 percent), as opposed to a mival-produced increase of 1.6 centner/hectare (5.7 percent). References 12 (Russian).

Pesticide Diffusion in Soil: Experimental Support of Forecast Models

947C0411A Moscow AGROKHIIMIYA in Russian No 6, Jun 94 pp 75-85

[Article by Yu.M. Matveyev, Soil and Land Resource Conservation Directorate at the Russian Federation Ministry of Environmental Protection and Natural Resources, Moscow; UDC 632.95]

[FBIS Abstract] Recent studies of pesticide migration in the soil according to which two main processes affect the pesticide migration and redistribution in the soil—convective mass transfer and diffusion—are discussed, and general pesticide migration in the soil is described in a first approximation; it is shown that a quantitative description of the pesticide mobility calls for assessing the total contribution of convective mass transfer and diffusion to the combined process of pesticide redistribution through the soil profile. To this end, an attempt is made to determine the contribution of diffusion to the combination of processes which affect the pesticide redistribution in the soil profile, analyze the soil factors

which affect diffusion, and estimate the possibility of developing mathematical forecast models. Thus, data on the diffusion mobility of pesticides in the soil acquired by various authors are generalized and processed. The study shows that diverse soil factors and conditions which vary from pesticide to pesticide affect diffusion, yet the sorption coefficient can be used as a unifying integral parameter; when it increases, diffusivity drops proportionately. In principle, prediction models can be constructed on the basis of cumulative data on the variability of the pesticide diffusivity D as a function of variations in the soil condition as well as on the basis of analytical equations which describe the relationship between the diffusivity, moisture content, and coefficient of sorption. It is speculated that due to the low diffusion rate of most of the pesticides used today, the initial distribution microheterogeneity will persist for an extended period of time. Figures 5; tables 5; references 17: 10 Russian, 7 Western.

System of Agrosphere Soil Contamination Monitoring

947C0411B Moscow AGROKHIIMIYA in Russian No 6, Jun 94 pp 86-96

[Article by M.S. Sokolov, V.I. Terekhov, All-Russian Scientific Research Institute of Biological Plant Protection, Krasnodar; UDC 631.95]

[FBIS Abstract] A report presented to the All-Russian scientific symposium "Xenobiotic soil pollution monitoring and adsorptive detoxification methods" is reprinted. The multifaceted nature of applied environmental science is noted, and the principal task of monitoring the soil biogeocenosis—detecting anthropogenic changes against the background of natural fluctuations and developing solutions for remediating the situation—is formulated. The main phases and organizational layers of the biogeocenosis contamination monitoring system are plotted, and it is stressed that soil contamination makes the food grown in this soil uncompetitive in international markets. The principal stages of the international background monitoring program adopted by UNESCO are outlined, and a flow chart for assessing the pollutant behavior in the agroecosystem in order to obtain farming and livestock products which are not contaminated with pesticide residues is presented. Five integral elements of soil contamination monitoring are identified: scientific and technical support of monitoring and forecasting; expert evaluation of the monitoring and forecast system; observation and tracking of the impact of anthropogenic factors on the soil and the resulting changes in the background; prediction of the consequences of pollution, risk assessment, and hazard control; and management and control steps aimed at eliminating the negative consequences of contamination. Figures 2; references 22.

BIOTECHNOLOGY

Fundamental Differences of Strategies of Therapeutic Action of Antibiotics and Endogeneous Protective Substances of the Macroorganism

947C0380 Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: BIOLOGIYA No 1 in Russian Jan-Mar 94 pp 11-26 (manuscript received 21 Sep 93)

[Article by A. P. Zarubina, A. V. Kaluyev and I. P. Ashmarin; Department of Human and Animal Physiology, Department of Microbiology (UDC 577.18:612.017)]

[FBIS Abstract] Comparison of differences in strategies of therapeutic action of substances of antimicrobial protection of microbial and animal origin showed a fundamental difference between antibiotics therapy and mechanisms of anti-microbial effects of animal activated phagocyte released factors. The first involves non-specific protection of higher organisms by endogenously forming anti-microbial substances and the second involves the action of antibiotics, formed by microorganisms, introduced into the body. This showed the promise of development of planned infection therapy, using the advantages of mechanisms of specific and non-specific protection of the organism which, without antibiotic therapy, may endanger the patient. The combination of the two strategies will provide more effective use of injected medicines and their proper use for as short a time as possible will promote the greatest effectiveness in realizing all mechanisms of non-specific and specific immunity. Figure 1; references 45: 31 Russian; 14 Western.

Therapeutic Efficacy of Reaferon for Meningoencephalitis

947C0362 Moscow VRACHEBNOYE DELO in Russian No 5-6, May-Jun 93 [manuscript submitted 23 Jun 1992] pp 95-98

[Article by A. F. Frolov, Ye. K. Trinus, L. V. Muravskaya, V. V. Kononenko, O. V. Novikova, S. T. Dyadyun, I. A. Petrovskaya, L. Ya. Kushko, Kiev Scientific Research Institute of Epidemiology and Infectious Diseases imeni L. V. Gromashevskiy; UDC 616.831.9-002.2-085.281.8+615.281.8]

[Abstract] Researchers have established in recent years that a secondary immune deficiency accompanies viral infections such as meningoencephalitis. The body's production of interferon drops dramatically. The scientific literature reports that interferon and drugs that induce it are active immune stimulants. The use of leukocytic interferon, however, is limited by cost concerns and inadequate supply, as a result of which recombinant interferon is used in the clinic. The researchers here observed 63 individuals treated with a regimen that

included reaferon for meningoencephalitis and 42 individuals who were treated with a regimen that did not include reaferon. The reaferon, produced by the Latvian plant Biopreparat, was administered to the experimental group for 10 days, IM. Positive effects for the experimental group consisted in a more rapid regression of symptoms such as headache, nausea and vomiting, and motor disturbance. Hospital stays were longer for the control group (45 vs. 35 days). In another part of the study, 26 individuals who had received reaferon demonstrated levels of T rosette-forming cells that were somewhat lower than those of healthy individuals. The subpopulation of theophylline-resistant T lymphocytes was smaller than that of T helpers, and the number of T suppressors was a bit higher. A third part of the study prompted the researchers to conclude that the use of reaferon can have a modulating effect on E cell activity. References 6 (Russian).

Study of the Functional Activity of the Regulator Region of SV40 Virus Integrated Into Recombinant Plasmids

947C0404A Moscow TSITOLOGIYA I GENETIKA in Russian Vol 28 No 2, Mar-Apr 94 (manuscript received 13 Oct 92) pp 55-62

[Article by S.M. Landau, L.I. Kolomiyets, and A.V. Tikhonov, Molecular Biology and Genetics Institute, Ukraine Academy of Sciences, Kiev; UDC 575.155:575.224.46]

[FBIS Abstract] A system has been proposed for transfection of eukaryotic vectors based on SV40. The system calls for simultaneous transfection of simian plasmid DNA and SV40 into permissive cultures. Cultures of CVI and COS cells were grown in 50-ml beds to a continuous monolayer (10^6 cells). The cells were infected with SV40 virus directly before the plasmid was added. The plasmid DNA was added as part of calcium-phosphate precipitate by incubating a monolayer of cells with the latter for 30 minutes and then growing the cell cultures in a supporting medium. Cell lysates obtained by the Hirt method were extracted daily for 3 days. Total DNA preparations were isolated by the phenol-detergent method and analyzed by dot-hybridization and autoradiography with 32 P-pBR322 and 32 P-SV40 DNA probes. An LKB Ultrascan-XL densitometer was used for the autoradiography studies. In the case of the COS cells, the accumulation of pGM plasmid peaked at 0.68 μ g (which is approximately 10^6 copies per cell). Replication of pSV9 plasmid in COS cells was significantly lower, i.e., 0.2 μ g. When SV40 and pSV9 were added to COS cells simultaneously, however, the level of plasmid DNA synthesis increased sharply. It reached 0.8 μ g, which is almost equal to the level of accumulation of pGM in CVI and COS cells. Thus adding SV40 induced a plasmid DNA replication level that is virtually equal to the level of replication of its own DNA. The level of plasmid DNA replication remains low, however, if the CVI cells are added a day before the plasmid is added. It was hypothesized that each SV40-infected cell contains a surplus of

T antigen sufficient for replication of plasmid DNA to the replication level of viral DNA. The experiments confirmed that under such conditions, "toxic" sequences have virtually no effect on the level of plasmid DNA replication. It was further hypothesized that the functional activity of the T antigen produced in CV1 cells a day after they have been infected with SV40 decreases sharply and that replication of plasmid DNA therefore proceeds at a low level. The functional activity of T antigen produced in COS cells was also concluded to be significantly lower than the functional activity of the T antigen produced during the course of viral infection. It was thus concluded that "toxic" sequences can only affect the synthesis of recombinant plasmid's own functionally active T antigen and that the T antigen synthesized by SV40 binds with the regulator eukaryotic region of recombinant plasmids, initiating their replication to the replication level of their own viral DNA. In other words, it was concluded that "toxic" sequences do not affect the binding of transactivated T antigen with recombinant plasmid. The proposed method of transfection of eukaryotic SV40-based vectors was said to offer the following advantages: 1) the method permits easy checking of the functional activity of the SV40 regulator region in recombinant plasmid; 2) expression of genes under the SV40 promoter will be at a maximum; 3) the system's conditions make it possible to expand the range of cell cultures that can be used to replicate recombinant DNA containing the SV40 regulator region; and 4) when the proposed method is used, easy-to-grown CV1 cell cultures are just as good as COS cell cultures, which can only be passaged in expensive imported nutrient media. Figures 4; references 11: 2 Russian, 9 Western.

Controlled Action of Pulsed Electromagnetic Field on Central Nervous System

947C0356E Moscow BIOFIZIKA in Russian Vol 39 No 3, May-Jun 94 pp 515-518 (manuscript received 30 Mar 1993)

[Article by V.A. Pestrayev, Ural State Medical Institute, Ekaterinburg (Signed to press 7 Mar 94)]

[FBIS Abstract] Studies of five mongrel rats showed that the weak effects of a pulsed (1 ms) electromagnetic fields (173 A/m) with dynamic frequency-pulsed modulation, regulated by feedback from an electrocorticogram and effects with fixed frequency of tracking of pulses in the infra-low frequency range have a different effect on the change of the functional state of the central nervous system of the rats in the sleep-wakefulness cycle. The first regime of effect was more effective for changing the nature of the bioelectric activity of the cerebral cortex while the second was more effective for supporting existing processes of synchronization. The study showed that selection and periodic change in time of regimes of effect of a pulsed electromagnetic field can promote development of new physiotherapeutic methods of controlled change of the nature of the overall bioelectrical activity of the cerebral cortex, based on feedback. Figure 1; references 7 Russian.

Design of Molecular Photo-Modulated Ion Channel Based on Gramicidin A and Its Electrochemical Properties

947C0396A Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 10 No 5, Sep-Oct 93 (manuscript received 9 Oct 1992) pp 535-543

[Article by S.V. Sukhanov, B.B. Ivanov, V.Yu. Orekhov, L.I. Barsukov, and A.S. Arsenyev, Bioorganic Chemistry Institute imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Moscow; UDC 577.352.26+577.352.465]

[FBIS Abstract] A new photoisomerizable analogue of gramicidin A (photo-GA) was synthesized by connecting two gramicidin A molecules by a connecting bridge containing a 4,4'-bis(succinylglycylamidol)azobenzene radical. The properties of ion channels formed by photo-GA in bilayer lipid membranes [BLM] synthesized from a solution of phosphatidylcholine in n-decane were studied. Light- and darkness-adapted BLM containing photo-GA were irradiated by ultraviolet light from a mercury ultraviolet radiation source with a power of 100 W and wavelength of 366 nm (model UV-source 366 nM, Desaga, Germany) and with visible light from a conventional 10-W incandescent lamp. The studies were performed at room temperature. Irradiation of the photo-GA-containing BLM caused transitions between the stationary levels of the membranes' integral conductance so that dark current (I_d), UV photocurrent (I_{UV}), and visible light photocurrent (I_{vis}) were observed in the following relationship: $I_d < I_{vis} < I_{UV}$. At room temperature, the conductance of single ion channels amounted to 2.4 ± 0.2 pS in 100 mM KCl. The selectivity of UV-activated channels was determined by recording the membrane's volt-ampere characteristics under asymmetric salt conditions (one side of the membrane was in a solution of 100 mM KCl while the other side was in a solution of 150 mM KCl). The ratio of the membranes' permeability for potassium and chlorine ions was calculated as 47 ± 15 . This result was taken as an indication of the fact that UV irradiation activates cation channels in the membrane as in the case of gramicidin A itself. Studies of the effects of repeated exposure to alternating UV radiation and visible light established that the current of a photo-Ga-containing BLM increases after each exposure to UV light but then subsides again to its respective stationary level after subsequent exposure to visible light. Further experiments confirmed that ion blockers (e.g., Ba^{2+} ions, which are typical blockers of gramicidin channels) afford additional possibilities with respect to regulating the electrochemical properties of photosensitive channels. The experiments thus confirmed the possibility of producing photo-modulated ion channels with specified electrochemical characteristics by varying the structure of the connecting bridge and indicated new avenues in designing photobiosensors for recording, storing, and processing optical information. Figures 4; references 11: 1 Russian, 10 Western.

Analysis of Distribution of Alleles of Four Hypervariable Tandem Repetitions Among Unrelated Representatives of Russia Living in Moscow, With Aid of Polymerase Chain Reaction

947C0375B MOLEKULYARNAYA BIOLOGIYA in Russian Vol 27, No 6, Nov-Dec 93 pp 1304-1314 (manuscript received 28 Oct 1992)

[Article by V. V. Christyakov, D. K. Gavrilov, I. V. Ovchinnikov and V. V. Nosikov, Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow (UDC 575.1:577.1)]

[FBIS Abstract] Determination of frequencies of encounterability of alleles in four hypervariable loci of a human genome containing tandem repetitions with changing number of copies (loci D1S80, D17S30, APOV and IGIH) among 120 unrelated Russians living in Moscow showed a high level of polymorphism of these hypervariable regions, characterized by the presence of alleles of different sizes. Data obtained indicated that the distribution of alleles of the hypervariable regions studied is practically the same as that found in other groups living in Europe and North America. Figures 2; references 27: 2 Russian, 25 Western.

Integration of *Corynebacterium Glutamicum* lysC and asd Genes in γ -Phage's attB Site on *E. coli* Chromosome

947C0409A Moscow BIOTEKHNOLOGIYA in Russian No 1, Jan 94 pp 12-14

[Article by M.Yu. Peredelchuk, N.D. Fedorova, Yu.V. Smirnov, V.G. Debatov, Scientific Research Institute of Commercial Microorganism Genetics and Selection, Moscow; UDC 579.252.5]

[FBIS Abstract] The urgency of obtaining new cloning vectors whereby traditional vectors engineered on the basis of natural plasmids and bacteriophages are autonomously replicated in the bacterial cell and the emergence of a new genetic engineering trend—production of the so-called chimaera chromosomes—prompted an attempt to describe the pBRIK integrative plasmid vector for *E. coli* which carries the int gene and attP site of the γ -phage in cis and to demonstrate the capability to integrate a foreign DNA cloned within pBRIK into the γ attB site of the *E. coli* chromosome using the example of the *Corynebacterium glutamicum* lysC and asd genes which had been cloned earlier. The bacterial strains, plasmids, and phages used in the experiment are outlined. The γ -phage DNA fragments were produced from a commercial preparation made by the Biotech Association using the Fermentas enzymatic preparations from Lithuania. The experiment succeeded in constructing a plasmid vector of site-specific integration of a foreign recombinant DNA into the γ attB site of the *E. coli* chromosome. The resulting plasmid contains the int gene and att site of the γ -phage and the aph gene which ensures kanamycin resistance. Thus, a foreign DNA

fragment which carries lysC and asd genes of *Corynebacterium glutamicum* was cloned within the plasmid vector and integrated into the γ attB site. Figures 3; tables 1; references 13: 1 Russian, 12 Western.

Use of Amphiphilic Compounds as Probes for Studying Plague and Cholera Bacteria Membrane Structure and Functions

947C0409B Moscow BIOTEKHNOLOGIYA in Russian No 1, Jan 94 pp 23-26

[Article by I.M. Fomenko, V.I. Krupenina, B.N. Mishankin, T.I. Tkacheva, State Anti-plague Scientific Research Institute, Rostov-na-Donu; UDC 579.842.23: 579.843.1:577.1]

[FBIS Abstract] Emerging evidence that the principal mechanism by which alcohols affect the organism is the membrane's lipid bilayer penetration by alcohols' amphipathic molecules and the resulting adaptational changes in the lipid chemical composition and membrane permeability and viscosity and thus, changes in the activity of the membrane-related enzymes and transmembrane metabolite flows, prompted an investigation into the metabolism and ultrastructure of the etiological agents of plague and cholera with a varying degree of virulence grown in media containing amphiphilic compounds which are general membrane perturbants. To this end, 95 plague microbe and 308 El tor *Vibrio cholerae* strains of varying virulence isolated in recent years from various cholera and plague outbreak sites were studied. The effect of ethanol on the growth patterns and ultrastructure of these etiological agents was examined; the study revealed that in the presence of ethanol, both virulent and avirulent strains result in an opposite-directed change in the cultivation medium's pH. Changes in the ultrastructure of the avirulent cells grown in a medium with alcohol were detected. The avirulent cells are less resistant to stress situations, which is probably due to membrane defects. It is speculated that defects in the avirulent cell membrane are responsible for the decrease in their virulence. The differences in the membrane structure enable the virulent cells to maintain the functional activity of the enzyme systems under the effect of membranotropic agents. The findings confirm that the use of subbacteriostatic concentrations of amphiphilic compounds which are general membrane perturbants makes it possible accurately to differentiate between the gram-negative bacterial strains which is otherwise impossible in conventional nutrient media. Figures 2; references 17: 5 Russian, 12 Western.

Mutagenic Activity of Recombinant Plasmid DNA in Competent *Bacillus subtilis* Culture

947C0379A Kiev TSITOLOGIYA I GENETIKA in Russian Vol 28 No 1, Jan-Feb 94 (manuscript received 08 Sep 92) pp 66-73

[Article by I. S. Karpova, O. V. Pidpala, V. N. Shulzhenko, I. Ye. Kostetskiy, N. V. Koretskaya, L. L.

Lukash; Molecular Biology and Genetics Institute, Ukrainian SSR Academy of Sciences, Kiev; UDC 575.224]

[FBIS Abstract] A novel method of DNA mutagenesis using a competent *Bacillus subtilis* culture capable of absorbing linear and circular DNA of any origin was employed to determine the mutagenic activity of DNA molecules. Five plasmids of common origin, differing in size and quality of the cloned fragment of alien DNA, were involved in the study. All preparations had insignificant amounts of cDNA and no RNA. The results showed that the plasmid pUC18 possessed no mutagenic properties, while plasmid pWT had the greatest mutagenic effect. It was also found that the mutagenic effect is concentration-dependent, and that linear plasmid DNA is much less effective as a mutagen. In addition, it was shown that 8-40 percent of the mutants obtained using the DNA of recombinant plasmids bound to the fragment of alien DNA. In conclusion, the findings indicate that high competence of the culture and high concentration of the preparation are essential to manifestation of the mutagenic effect of plasmid DNA. Figures 2; tables 2; references 39: 23 Russian, 16 Western.

Production of *Pseudomonas putida* 27 Mutants That Have Lost Ability To Produce Antimicrobial Substances and Their Complementation Analysis

947C0379B Kiev TSITOLOGIYA I GENETIKA in Russian Vol 28 No 1, Jan-Feb 94 (manuscript received 23 Jul 92) pp 77-79

[Article by I. N. Stekhin, M. V. Kovalchuk, A. I. Melnik, B. V. Polevoda, S. M. Stolyar, Z. F. Ismailov, L. S. Chernin, Plant Physiology and Genetics Institute, Ukrainian Academy of Sciences, Kiev; Bioengineering Center, Russian Academy of Sciences, Moscow; UDC 578.887.111.25]

[FBIS Abstract] This paper discusses the production of *Pseudomonas putida* 27 mutants that have lost the ability to produce anti-microbial substances and the complementation analysis of them with the use of clone libraries from the original strain. The specific strain employed in this case was resistant to streptomycin and chloramphenicol. Using Tn5 mutagenesis and conventional methods, two clones were selected that had completely lost the ability to produce antimicrobial substances. As a result of complementation analysis of the mutants with the use of a clone library, recombinant clones were selected to restore the antimicrobial activity of the original strain. Figures 1; references 11: 1 Russian, 10 Western.

Description of Polymorphism in Lengths of Restriction Fragments of DNA From Strains of *Coxiella burnetii* Isolated in Russia

947C0378A Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 6, Nov-Dec 93 (manuscript received 25 Jan 93) pp 13-16

[Article by V. V. Demkin, N. K. Tokarevich, Ye. B. Rydkina, V. A. Kuzina, N. A. Kartseva, A. B. Dayter, N.

M. Balayeva; Epidemiology and Microbiology Scientific Research Institute imeni N. F. Gamaleya, Russian Academy of Medical Sciences, Moscow; Institute imeni Pasteur, St. Petersburg; UDC 579.881.13: 579.253].083.12]

[FBIS Abstract] The structural heterogeneity of *Coxiella burnetii* chromosomal DNA isolated in European Russia from people, farm animals, and ticks was studied. Results of restriction endonuclease digestion showed that strains isolated from Russia and Mongolia were essentially identical despite the significant physical distance between them, while these same strains differed from the genomic group that includes strains Henzerling and M44. Analysis of polymorphism in the lengths of DNA restriction fragments enables more detailed marking of strains in comparison with other methods. In conclusion, this method will be important to solving theoretical and applied problems. Figures 2; tables 1; references 8: 2 Russian, 6 Western.

Quantifying *Bacillus anthracis* Using Soybean Agglutinin Conjugates

947C0378B Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 6, Nov-Dec 93 (manuscript received 01 Jul 93) pp 27-29

[Article by N. L. Kalinin, K. L. Shakhnina, M. N. Kulyakina, Epidemiology and Microbiology Scientific Research Institute imeni N. F. Gamaleya, Russian Academy of Medical Sciences, Moscow; UDC 616.981.453- 092]

[FBIS Abstract] The possibility of using a soybean agglutinin (SBA)- horseradish peroxidase (HRP) method for measuring *Bacillus anthracis* under primitive conditions was investigated. The results showed that application of the SBA-HRP conjugate (5 µg SBA and 6.3 µg HRP) permits reliable quantifying of 10^5 - 10^8 cells/ml of *B. anthracis*, while using specific antibodies instead of SBA requires 24 mg/ml HRP to be included with the antibodies in the conjugate to quantify the same number of *B. anthracis* cells. The results also confirmed that the use of biotin- or HRP-labeled SBA is more sensitive, but the SBA biotin method has the advantage of producing minimum background values. In conclusion, this method is also simple, fast, reliable and inexpensive. Figures 2; references 19: 4 Russian, 15 Western.

Multiple Hybridization Analysis. A Simultaneous Use of Two or Three Non-Radioactive Labels for DNA-Probes: Biotin, Digoxigenin and Trans-Diaminedichloroplatinum

947C0378C Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 6, Nov-Dec 93 (manuscript received 7 Jun 93) pp 29-31

[Article by M. F. Turchinskiy, T. B. Kolesnik, O. L. Kunitsyna, S. N. Shcherbo, S. V. Volik, V. I. Kiseleva, A.

M. Poverenniy, I. S. Pavlova, E. D. Sverdlov, Bioorganic Chemistry Institute imeni M. M. Shemyakin, Russian Academy of Sciences, Moscow; Medical Radiology Scientific Research Institute, Russian Academy of Sciences, Obninsk; UDC 616.982-002.07]

[FBIS Abstract] This paper describes simultaneous hybridization with 2-3 different probes bearing different labels: biotin, digoxigenin, and trans-diamminedichloroplatinum. Three DNA samples with different preassigned sequences were employed: pBR322, λ gI-phage, and M13mp18-phage. The products of the digestion of these phages by restriction enzymes were targets in Southern blot hybridization, whereas the DNA samples, labeled with digoxigenin (M13mp18), DDP (λ -phage DNA), or biotin (pBR322), were probes simultaneously added to the hybridization blend. The researchers combined two different methods to arrive at their original simultaneous hybridization technique: Following hybridization with three different polynucleotide probes, two labels out of three were bound to two different enzymes. These were then treated with chromogenous substrates of alkaline phosphatase and horseradish peroxidase, and then the biotin label was bound to a horseradish peroxidase-streptavidin conjugate and developed by another peroxidase substrate. Total development time: 2.5 hours. Figures 3; references 10: 3 Russian, 7 Western.

EPIDEMIOLOGY, MICROBIOLOGY, AND VIROLOGY

Epidemiological and Clinical Features of Campylobacteriosis in Ukraine

947C0361 Moscow VRACHEBNOYE DELO in Russian
No 5-6, May-Jun 93 [manuscript submitted 25 May 92]
pp 92-94

[Article by D. L. Kirik, Ye. A. Shablovskaya, N. M. Krolevetskaya, A. A. Vasilchenko, N. M. Ralko, V. Ye. Ponomareva, V. K. Kovalchuk, L. A. Palatnaya, I. G. Badakina, V. S. Konovalova, Scientific Research Institute of Epidemiology and Infectious Diseases imeni L. V. Gromashevskiy, Kiev Medical Institute; UDC 616.98:579.835.12(036.2-078)(470.311-25)]

[FBIS Abstract] Clinical-epidemiological, bacteriological, and serological tests were studies were conducted among 181 youths hospitalized for acute intestinal infection. The diagnosis of campylobacteriosis was confirmed in 21 individuals (or 12 percent) as a result of the isolation of *C. jejuni* and *C. coli*. The 21 youths presented with intestinal dysfunction consisting of a liquid stool that contained mucous and, sometimes, blood. Four of the individuals had had contact with chickens. *C. jejuni* was isolated in three of eight mothers examined. Two mothers reported intestinal dysfunction. Chickens appeared to play a role in the infection of the individuals examined, a fact that was also suggested by the similarity in the R spectra of the chicken and human

cultures. Transmission probably came though routine contact with the chickens, as well as contact with them in the workplace. Intrauterine transmission was not ruled out. References 7: 5 Russian, 2 Western.

System of Mass Combined Vaccination of Adult Population Against Influenza, Viral Hepatitis, Typhoid Fever, Meningitis and Diphtheria

947C0372A Moscow ZHURNAL MIKROBIOLOGII,
EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian
No 5, Sep-Oct 93 (manuscript received 13 Nov 91)
pp 50-55

[Article by K. G. Gapochko, T. S. Titova, V. A. Khari-tonova, O. P. Misnikov, A. P. Savelyev, A. V. Stepanov, A. P. Alliluyev, M. A. Bichurina, N. M. Maksimova, N. A. Ozeretskovskiy, V. S. Perepelkin, and O. G. Tsint-sadze, Scientific Research Institute of Military Medicine, St. Petersburg, under the rubric "Vaccinology"; UDC 615.371:578.832.1]+615.371:578.891]

[FBIS Translated Text] At the present time, there is no scheduled mass preventive vaccination (PV) of the adult population against infectious diseases (ID). Yet preventive medicine requires inoculations when there are epidemiological indications, the main ones being the socio-economic situation, morbidity rate and dynamics of incidence of ID. Statistical analysis revealed that the following ID present the greatest epidemiological danger to the public: influenza, upper respiratory diseases, the incidence of which is 4500-70,000/100,000 population, dysentery—400, viral hepatitis—260, tuberculosis—42.4, meningococcal infection—6.6, typhoid-paratyphoid diseases—7.8, brucellosis—2.1, tick-borne encephalitis—0.76, and diphtheria—0.13 [1, 3]. Vaccines against influenza, typhoid fever, meningococcal infection, tuberculosis, as well as normal human immunoglobulin used to prevent viral hepatitis A, are used for inoculations. Experience in carrying out such inoculations revealed that there are considerable problems with respect to quality and timeliness of performance.

In particular, immunization extends over a long period of time. This is related to the fact that the instructions for such inoculation agents indicate that there be 1-2-month intervals between administration of different vaccines. Moreover, mass inoculations require frequent leaves from jobs, which complicates organization of inoculations, lowers coverage of the public with vaccination and prevents establishment of immune protection within a short period of time [3, 6, 7].

In view of the wide geographic distribution of the above-mentioned ID, their seasonal nature, rather frequent outbreaks and epidemics, it would be quite desirable to administer combined inoculations. Experimental and clinical-immunological observations, which have shown the safety, tolerance and efficacy of combined immunization against typhoid-paratyphoid diseases and diphtheria, as well as tuberculosis and typhoid fever, tuberculosis and diphtheria, tuberculosis, typhoid fever

and diphtheria [2, 4, 5], serve as grounds for such practice, but these systems have not been adopted in medical practice.

The purpose of this study was to work out systems for combined and associated immunization against influenza, viral hepatitis A, meningococcal infection, typhoid fever and diphtheria, for simultaneous administration of several vaccine preparations, including those in the form of a mixture of monovaccines.

Material and Methods

In this study we used domestically produced commercial vaccines: meningococcal dry polysaccharide vaccine, serogroup A (MV) produced by the Moscow Research Institute of Epidemiology and Microbiology imeni G. N. Gabrichevskiy; diphtheria toxoid AD-M (DT), produced by the Biomed Enterprise imeni I. I. Mechnikov; chemical sorbed liquid typhoid fever vaccine (TFV) and BCG tuberculosis vaccine produced by the "Vaccine" Scientific Production Association in Tashkent; inactivated, liquid, centrifuged influenza vaccine (IV) produced by the Vostok Production Association; normal human immunoglobulin (IG) manufactured at the enterprise of the Moscow Research Institute of Epidemiology and Microbiology imeni G. N. Gabrichevskiy. We also tested experimental series of inactivated, chromatographic influenza vaccine from strain A/Leningrad/385/80 (H3N2) (ICIV) produced by the St. Petersburg Research Institute of Epidemiology and Microbiology imeni Pasteur.

In the experiments, we used 260 chinchilla rabbits weighing 2.5-3 kg, 710 guinea pigs weighing 250-300 g, as well as 440 mongrel and 400 CBA mice. Humans were vaccinated under actual working and living conditions in an organized group (542 people 21-30 years old) of essentially healthy men without contraindications to the inoculations.

Safety and reactogenicity of the inoculations were assessed using conventional methods. Immunological efficacy of vaccination in the experiment and with use on humans was assessed 15 and 30 days after immunization according to percentage of seroconversions and mean antibody titer in blood serum. Antibodies to MV were demonstrated using a microtechnique for the passive hemagglutination test (PHA), DT was tested by the indirect hemagglutination test (IHA) using a microtechnique with standard toxin, TFV—by PHA (microtechnique for demonstration of O and Vi antibodies), ICIV—by the hemagglutination inhibition test (HAI), and IG—by radioimmunoassay (RIA) of specific antibodies to hepatitis A virus. In addition, we measured intensity of postvaccinal immunity by infecting immunized animals with virulent strains or toxins.

In the clinical tests, we studied the effect of inoculations on the body using modern clinical laboratory, psychophysiological and instrument methods involving use of functional load tests [3].

The obtained data were submitted to statistical processing using Student's *t*-criterion.

Results and Discussion

Experimental study of compatibility and competitiveness of products to be used in subsequent tests resulted in formation of two optimum combinations of vaccines: 1) mixtures of MV and DT, TFV and IV injected with a syringe subcutaneous in three different points (MV + DT) + TFV + IV; 2) mixtures of MV and DT, TFV and IG given analogously (MV + DT) + TFV + IG.

A study of safety and reactogenicity revealed that both the first and second variants of this system did not differ quantitatively from parameters characterizing monovaccines according to the behavior and death of immune animals, weight loss, febrile reactions and local changes.

Histological examination of 95 guinea pigs, carried out from the first to 30th days, enabled us to detect signs of immunomorphological changes in the organs examined (injection site, lymph nodes, liver, spleen, heart, bone marrow, brain and thymus) that were notable for speed of occurrence and reversibility. However, there was no appreciable aggravation of the reactive pathological process with combined inoculations.

Serological tests revealed that there were no differences in parameters characterizing those inoculated with the first and second variants of combinations, and with monovaccines.

Evaluation of intensity of postvaccinal immunity after infecting experimental animals with virulent strains or toxins revealed that the TFV used in both variants of combination formed immunity to typhoid fever that was as good as after use of monovaccine. Intraperitoneal infection of albino mice 10 days after immunization with a virulent culture (strain Ty₂4446) in a dosage of 3-6 LD₅₀ protected 79-88 percent of inoculated animals, versus 100 percent death in the control. Immunogenicity of DT both after administration alone and in combinations 1 and 2 to guinea pigs was tested by hypodermic infection with 100 MLD DT guaranteed 100 percent insusceptibility in all groups of inoculated animals, versus 100 percent death in the control. Intensity of postvaccinal immunity was determined by infecting vaccinated albino mice with a homologous IV strain according to the criterion of decrease in its reproduction in the lungs, which determined the extent of enhancing protection. IV used twice for the second inoculation in combination with (MV + DT) + TFV increased animal resistance by 3-5 times, and this was virtually the same as the efficacy of monovaccine.

We did not have any direct methods to assess intensity of immunity produced by MV and IG, and for this reason we used data on 100 percent seroconversion in virtually equal titers, observed after combined and separate use of these products (IHA, RIA). It was found that monopreparations of IG and MV had no adverse effects; however,

with use of combination 1 MV was more effective than when combined with IG, and this is what ultimately caused us to form the second combination variant. The positive results obtained in the experiment confirmed immunogenicity of the association of vaccines included in the system we developed for preventive vaccinations and enabled us to start testing it on humans following protocols approved by the Committee for Medical Immunobiologicals. In these tests, as in the experiment, we tested two variants: 1) (mixture of MV + DT) + TFV + IV; 2) (mixture of MV + DT) + TFV + IG. In the first version, 0.5 ml (MV + DT) was injected subcutaneously under the scapula on one side, 1 ml TFV subcutaneously under the other scapula, 0.5 ml IV subcutaneously in the lateral surface of the left arm. With the second variant, IV was not used, while 1.5 mg IG was injected i.m. in the superior lateral quadrant of the buttocks. People vaccinated with a corresponding dose of monovaccines plus injections of saline served as a control group.

The subjects were checked clinically on a daily basis for the first week after inoculation, then we studied immunogenicity of the products after 15, 30 and 180 days.

Evaluation of safety revealed that there were insignificant local reactions to immunization. Thus, half the vaccinated subjects showed formation of a circumscribed (≤ 2.5 cm), moderately tender infiltrate in the region of injection of TFV, which disappeared in 2-3 days. As a rule, there was no tissular edema or regional lymphadenitis. The mixture of MV and DT elicited small (≤ 0.5 cm) infiltrates in 8.3 percent of those inoculated, and in 21 percent of these cases they were combined with small, pain-free regional lymphadenitis.

General postvaccinal reactions (PVR) were characterized by mildness, stereotypy and rapid (within 12-48 h) reverse development. According to the conventional classification of PVR based on intensity of febrile

response, the reactions are classified as mild, moderate and severe. When work capacity was impaired the case was rated as severe. The general condition of subjects with PVR was satisfactory. They complained of weakness, malaise, moderate headache, impaired sleep, but all retained the ability to work. Brief fever was a mandatory symptom of the reaction. However, in spite of clinical stereotypy and reversibility of observed PVR, their frequency and severity varied appreciably, depending on the number and distinctions of injected vaccines. Greatest reactogenicity was observed with combined (associated) vaccination in variants 1 and 2 (no differences were found according to this parameter). General reactions were recorded in 50 \pm 5 and 53 \pm 7 percent of the cases among 221 and 78 inoculated subjects, respectively, and they were mild in the vast majority (46 \pm 5 and 40 \pm 7 percent) or moderate (4 \pm 2 and 13 \pm 2 percent). No severe reactions were observed.

Clinical-physiological, hematological, biochemical and instrument studies carried out in the postvaccinal period failed to reveal pathological changes in inoculated subjects. The functional state of the cardiovascular system and energy-motor component of physical work capacity, as determined by load tests, was indicative of satisfactory tolerance of vaccination. Psychophysiological testing of inoculated subjects in the presence of PVR showed subjective worsening of their condition which, however, was accompanied by improvement of attention and thinking indicators. The inoculated subjects retained their professional work capacity.

A study of the immunological response after both combined inoculations and separate constituents of products used revealed that associated complexes (variants 1 and 2) elicited typical and distinct immunological changes with maximum accumulation of antibodies after 1 month and gradual decline of parameters over a period of 6 months, without exceeding "baseline" levels (see Table).

Immunological efficacy of combined (associated) immunization (M \pm -m)

Tested material	Vaccination protocol	Method	Number of paired sera	Mean antibody titers, IU			Positive seroconversions, %		
				time of test, months					
				baseline	1	6	baseline	1	6
MV	(MV+DT)+TFV+IV	PHA	57	40 (20-80)	640 (320-1280)	160 (80-320)		91 \pm 4 (81-97)	67 \pm 7 (52-81)
	(MV+DT)+TFV+IG	PHA	53	80 (40-160)	640 (320-640)	160 (80-160)		79 \pm 6 (66-89)	68 \pm 8 (49-63)
	MV	PHA	26	40 (20-160)	320 (320-1280)	160 (40-160)		65 \pm 10 (44-83)	55 \pm 6 (23-83)
DT	(MV+DT)+TFV+IV	IHA	57	640 (320-1280)	2560 (1200-2500)	640 (640-1200)		58 \pm 7 (44-71)	7 \pm 5 (2-19)
	(MV+DT)+TFV+IG	IHA	65	320 (160-640)	1280 (1200-2500)	640 (640-1200)		67 \pm 6 (54-78)	26 \pm 7 (15-42)

	DT	IHA	33	320 (80-640)	1280 (1200-2500)	640 (320-2500)		79+/-7 (61-91)	28+/-10 (11-52)
TFV _O	(MV+DT)+TFV+IV	PHA	61	40 (40-40)	80 (80-160)	80 (80-80)		82+/-5 (70-91)	88+/-5 (75-95)
	(MV+DT)+TFV+IG	PHA	54	40 (40-40)	160 (80-160)	80 (80-80)		91+/-4 (80-97)	84+/-5 (71-97)
	TFV _O	PHA	14	40 (20-80)	80 (40-80)	80 (80-160)		50+/-14 (23-77)	69+/-14 (39-91)
TFV/V _i	(MV+DT)+TFV+IV	PHA	61	20 (20-40)	80 (80-160)	40 (40-80)		100+/-2 (94-100)	92+/-4 (80-98)
	(MV+DT)+TFV+IG	PHA	54	20 (20-20)	80 (80-160)	80 (40-80)		97+/-2 (90-100)	98+/- (89-100)
	TFV/V _i	PHA	14	20 (20-20)	80 (40-160)	120 (40-160)		86+/-10 (57-98)	98+/-8 (64-100)
IG	(MV+DT)+TFV+IG	RIA	64	20 (10-40)	80 (40-80)	80 (40-80)		63+/-6 (50-74)	60+/-6 (46-72)
	IG	RIA	10	10 (0-40)	40 (40-80)	80 (40-160)		70+/-15 (35-93)	80+/-13 (44-98)
IV _{A1}	(MV+DT)+TFV+IV	HAI	48	26.6*	42.0	39.0	15+/-5 (6-28)	29+/-6 (17-41)	31+/-7 (19-49)**
	IV	HAI	21	19.7	32.0	39.0	5+/-5 (0-24)	10+/-4 (1-30)	19+/-10 (5-42)
IV _{A3}	(MV+DT)+TFV+IV	HAI	48	74.0	128.0	128.0	75+/-6 (60-86)	92+/-4 (80-98)	98+/-2 (83-98)
	IV _{A3}	HAI	21	74.0	128.0	192.0	81+/-9 (58-95)	95+/-5 (76-100)	95+/-5 (76-100)
IV _B	(MV+DT)+TFV+IV	HAI	48	49.0	97.0	49.0	40+/-7 (26-55)	70+/-7 (56-83)	38+/-7 (24-53)
	IV	HAI	21	56.0	74.0	52.0	65+/-11 (38-82)	38+/-11 (18-62)	38+/-11 (18-62)

*Reciprocals of geometric mean titers; **number of people with protective antibody titer.

The intensity and dynamics of accumulation of antibodies demonstrated after use of both variants of combined (associated) immunization showed virtually no difference from the antibody-production process after use of control monovaccines. This, in turn, is indicative of absence of marked competition between antigens of the combination studied and proves their immunological compatibility.

Conclusions

1. A system of combined (associated) immunization against meningitis A, diphtheria, typhoid fever, viral hepatitis A and influenza was developed in experimental and clinical-immunological studies; it is harmless, moderately reactogenic and immunologically effective.

2. Depending on the epidemiological situation, this system can be used in two variants: 1) mixture of serogroup A meningococcal vaccine and diphtheria toxoid, typhoid and influenza vaccine, (MV+DT) + TFV + IV, injected with a hypodermic syringe in three different points; 2) the same mixture, typhoid vaccine and normal human immunoglobulin, (MV+DT) + TFV + IG, analogously, and both variants could also be used with exclusion of vaccines that are not applicable under given conditions.

The proposed system has been recommended for use in practice by the Committee for Medical Immunobiologicals.

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Legislative Regulation of Veterinary Work in Tatarstan Republic

947C0393A Moscow VETERINARIYA in Russian No 1, Jan 94 (signed to press 24 Dec 93) pp 3-6

[Article by F. S. Sibagatullin, Tatarstan Minister of Agriculture and Food, and I. N. Nikitin, professor, Kazan Veterinary Institute]

[FBIS Translated Text] The law "On veterinary medicine in Tatarstan" was drafted by this republic's cabinet of ministers, approved by its Supreme Soviet on 13 July 1993 and put into effect on 12 August 1993.

The need to enact this law is attributable to the following circumstances:

1. In the 200 years of existence of scientific and practical veterinary medicine, there was no special law in Kazan Province and the Republic of Tatarstan, about veterinary medicine, and this hindered performance of veterinary work.
2. The veterinary service in Tatarstan is uncoordinated and subordinated to different ministries and agencies of Tatarstan and the Russian Federation, which deprives it of purposeful implementation of a unified republic program for prevention and eradication of animal diseases. There are veterinary services that are part of: enterprises of the ministries of internal affairs, light industry, meat industry, dairy industry; ancillary farms of industrial enterprises under republic and Russian subordination; zonal service of veterinary monitoring on the railroad, maritime and air transport subordinated to the RF Ministry of Agriculture. Each of them is independent and not subject to control to the present State Veterinary Service of the Tatarstan Ministry of Agriculture and Food which, moreover, does not have sufficient legal power to influence them.
3. Tatarstan's international ties with Hungary, Turkey and other countries, import of pedigreed and commercial livestock require implementation of direct relations with foreign states and CIS member states. The procedure established under present conditions, and absence of their own legislation on veterinary medicine do not permit resolving these matters bypassing the RF Veterinary Department.
4. The diversity of forms of ownership, existence of different types of farms engaged in livestock production, the broad development of processing of milk and meat in small enterprises, organization of production of sausages and smoked meats in private enterprises and peasant (farmer) farms require improvement of veterinary services and intensification of state veterinary monitoring. However, without a law on veterinary medicine, it is impossible to solve these problems expeditiously and effectively.
5. The existence in Tatarstan of different infectious diseases (tuberculosis, brucellosis, leukemia, rabies, etc.)

and their broad distribution in some rayons (Cheremshanskiy, Bavlinskiy, Muslyumovskiy), the high incidence of non-contagious animal diseases are related to infraction of veterinary rules, technology for animal upkeep and feeding. The state veterinary service does not have legal power to deal with those who break veterinary and technological rules. Yet, because of widespread occurrence of some contagious diseases, ailments and death of cattle, Tatarstan farms sustained a loss of more than one billion rubles in 1992 alone, according to our estimates.

The law "On veterinary medicine in Tatarstan" differs from analogous laws of CIS member states in that it is oriented toward protection of the interests of each veterinary specialist. Its first section contains: legal regulation of the state and industrial veterinary service, veterinary cooperatives and veterinary entrepreneurship; the right to practice veterinary medicine; explanation of powers of agencies of state power and administration of Tatarstan on matters of veterinary medicine (with separation of authority of the Supreme Soviet, Tatarstan cabinet of ministers, local agencies of state power and administration—administrations of rayons and cities).

The second section (pp 5, 6, 7) defines the tasks for the state and industrial veterinary services, establishes a system of state veterinary service that comprises the Main Administration of Veterinary Medicine under republic cabinet of ministers, state veterinary associations of rayons and cities. In establishing the Main Administration of Veterinary Medicine of the Tatarstan cabinet of ministers, the people's deputies took into consideration the historical experience in veterinary work in Kazan Province (the state veterinary service was part of the provincial administration and acted on behalf of the governor) and Tatar ASSR (in 1920, the Central Veterinary Administration was founded with the rights of an independent people's commissariat). The competence of the state veterinary service in Tatarstan was determined.

The following is within the purview of the state veterinary service in Tatarstan Republic:

1. Management of activities of institutions of the state and industrial veterinary services, monitoring performance of veterinary cooperatives, small enterprises and veterinary specialists engaged in entrepreneurial activities.
2. Coordination of activities of enterprises, organizations and individuals dealing with implementation of the set of epizootic-control and veterinary-sanitary measures.
3. Elaboration of basic guidelines and strategic directions of development of veterinary medicine in the republic, refinement of its organizational forms.
4. Organization of measures for the prevention of contagious and non-contagious animal diseases; elaboration of republic programs to protect animals against particularly dangerous diseases.

5. Drafting proposals on institution and suspension of quarantine or other restrictions in the Republic of Tatarstan in the event of outbreak of epizootics of infectious diseases, and mass non-infectious animal diseases.

6. Elaboration of republic programs for veterinary protection of animals and animal products against radioactive, technogenic and other deleterious factors.

7. Organization and implementation of veterinary therapeutic work at collective farms, state farms and other farming enterprises and peasant farms.

8. Formation of republic orders for biological agents and other material and technical supplies necessary to veterinary welfare of livestock farming.

9. Establishment and distribution of a republic reserve of biological, therapeutic and disinfectant agents, and other material and technical supplies necessary to urgent epizootic-control and veterinary-sanitary measures in extreme situations.

10. Organization of veterinary records and accountability, statistical analysis of animal morbidity and efficacy of veterinary measures.

11. Determination of need for veterinary specialists. Organization and implementation of certification of veterinary specialists.

12. Issuing licenses for veterinary work to veterinary specialists, giving the right to production laboratories, shops, small enterprises and individuals to manufacture and sell products used in veterinary work; issuing licenses (permits) for entrepreneurial activities to veterinarians and feldshers.

13. State veterinary oversight of: condition of livestock enterprises, farms, enterprises in the meat, refrigeration, canning, dairy, leather, and wool-processing industries; enterprises engaged in the trade of animals and livestock products; public catering facilities and markets; design and construction of livestock farms, processing enterprises and veterinary facilities; transportation, export and import of animals, animal products and raw materials; protection of Tatarstan territory against possibility of bringing infectious animal diseases in from other countries.

14. Assessment of veterinary-sanitary condition of meat- and dairy- processing enterprises, slaughterhouses, fairs, markets, warehouses for storage of animal raw materials and products, feed and vehicles used to transport them.

15. Implementation of veterinary-sanitary and ecological monitoring of foods of animal and plant origin.

16. Collaboration with international veterinary organizations, and foreign countries on veterinary matters.

Procedures have been spelled out for establishing and organizing: an industrial veterinary service at collective

and state farms, joint-stock companies and other enterprises of the agroindustrial complex; veterinary cooperatives and various forms of veterinary entrepreneurship in accordance with the RF law "On enterprises and entrepreneurial activities" and ukases of the president of Tatarstan dated 26 September 1992: "On providing steps for state regulation, support and protection of entrepreneurship in the Tatarstan Republic."

The third section (pp 8, 9, 10, 11) defines the duties of state and industrial veterinary oversight: list of measures to implement state veterinary oversight; rights of main state veterinary inspectors of Tatarstan, rayons and cities; main guarantees for activities of officials involved in state veterinary oversight; general statutes on industrial veterinary-sanitary oversight.

The fourth section (pp 12, 13, 14, 15, 16, 17, 18) lists the requirements for prevention and eradication of animal diseases, and for providing veterinary safety of livestock products. Veterinary rules were established pertaining to planning and construction of enterprises involved in production of livestock products, upkeep, feeding and watering animals, transporting or driving them; procurement, processing, storage, transportation and sale of livestock products; statute on protection of the Tatarstan Republic against penetration of animal diseases across its frontiers; duties of agencies of the state administration and officials in the state veterinary service with respect to eradication of sites of disease; rights, duties and responsibility of owners and consumers of animals and animal products; rules for isolating animals and removing livestock products in the presence of particularly dangerous contagious animal diseases.

It should be stressed that the owners of animals and products of animal origin have the right to: receive veterinary services for their animals and a conclusion as to fitness of products derived from them for consumption and other forms of use; demand a veterinary certificate when buying animals on the market.

It is mandatory for owners of animals and products to: obtain permission from the chief state veterinary inspector to build and operate livestock structures, and processing enterprises; isolate newly received animals; limit contacts with extraneous personnel and straying animals; have a veterinary document to remove animals; provide good feeding, upkeep and use; institute timely epizootic-control and veterinary-sanitary measures; immediately report instances of sudden death or simultaneous illness of many animals; provide the veterinary specialist with necessary working conditions and immobilization of animals during veterinary procedures; adhere to established rules when slaughtering animals; implement sanitary and veterinary measures to prevent animal disease; preclude environmental pollution, etc.

Animal owners are responsible for the health of their animals, their proper feeding, upkeep, use, and for furnishing safe and harmless livestock products.

When isolating animals and removing livestock products, enterprises, organizations and individuals have the right to be reimbursed for their loss from funds in the state budget in accordance with the statute approved by the Tatarstan cabinet of ministers.

The fifth section (pp 19, 20, 21) regulates protection of the public against diseases common to man and animals, and food poisoning. It defines the competence of the state veterinary service in the area of safeguarding public health, veterinary-sanitary expertise in livestock products, and establishes the procedure for interaction between administrative agencies and veterinary service institutions administrative agencies and institutions of the state sanitary and epidemiological service and Tatarstan Ministry of Protection of the Environment and Natural Resources.

The sixth section (pp 22, 23, 24) defines material and technical support of the veterinary service in Tatarstan. It establishes the sources of funding for the veterinary service and procedure for utilizing budget and cost-accounting funds; procedure for veterinary supply and benefits provided for veterinary specialists.

The state budget and cost-accounting assets received for performing veterinary work as contracted with collective and state farms, agrocombines, agrofirms, peasant (farmer) and private ancillary farms, as well as other non-budgetary income—voluntary contributions of enterprises, public organizations, charitable funds and individuals—are the sources of funding veterinary associations, and institutions of the state veterinary service.

Measures for prevention of spread and for control of contagious animal diseases, according to the list approved by agencies of the state veterinary service, are funded by allocations from the state budget.

Veterinary care rendered by organizations and institutions of the state veterinary service to collective and state farms, leasing organizations, cooperatives, peasant (farmer) and private ancillary farms, as well as veterinary measures at enterprises where animals are slaughtered, animal products and raw materials are processed, procured and stored, are reimbursed on the basis of contracts. The budgetary allocations earmarked for upkeep of state veterinary institutions are kept intact.

The Tatar republic "Zoovetsnab" [Zooveterinary Supply] association, under the immediate supervision of the Main Veterinary Administration of the Tatarstan cabinet of ministers furnishes special veterinary equipment to veterinary institutions, collective and state farms, other enterprises, organizations, veterinary cooperatives, and specialists engaged in entrepreneurial activities.

Veterinary pharmacies are being opened in each rayon as part of rayon veterinary associations for timely delivery of veterinary agents, equipment and instruments. Article 24. Benefits granted to veterinary specialists (complete text is given below).

1. Free apartments and municipal services are provided for veterinary specialists with higher and secondary special education who work in rayon veterinary associations and state veterinary institutions, those servicing rural areas, collective and state farms, other agricultural enterprises with different forms of ownership, as well as those who are pensioners, regardless of place of residence.

2. Bonuses are set for veterinarians and veterinary feldshers who have work tenure: 10 percent of their salary for continuous work for 5 years, 25 percent for over 10 years, and 50 percent for over 25 years.

3. Young veterinary specialists who have graduated from higher and secondary agricultural educational institutions, assigned to work at collective and state farms, and other agricultural enterprises and institutions of the Main Veterinary Administration of the Tatarstan cabinet of ministers are provided with apartments without having to be on a waiting list; they have priority in the purchase of prefabricated houses, and building materials for individual construction of housing.

The seventh section (pp 25, 26) deals with regulation of responsibility for infraction of Tatarstan veterinary legislation. A list is formulated of law violations in the field of veterinary medicine for which officials and individuals are criminally or administratively liable, or subject to disciplinary action; amounts of administrative fines and procedure for collecting them are given.

The list of violations in the field of veterinary medicine includes the following addenda:

- deliberate or unintentional spread of infectious and invasive animal diseases;
- engaging in veterinary work without special veterinary education and license from the state veterinary service;
- influencing officials involved in state veterinary oversight in order to prevent them from carrying out their legitimate work;
- prohibiting state veterinary inspectors access to targets of veterinary-sanitary oversight.

Article 26 establishes that 50 percent of the cash fines imposed for administrative violations are transmitted to state veterinary associations of rayons and cities. Tatarstan has provided legislation regulation of all forms of organization of veterinary work; it has improved the prestige of the occupation of veterinary specialist, increased responsibility of veterinary specialists for assuring veterinary well-being in the livestock industry and individual owners of animals, administrators of livestock enterprises for abiding by zoohygienic and veterinary-sanitary rules for care, upkeep and feeding of animals.

Current Trends in Epizootiology of Foot and Mouth Disease in Central Asia

947C0393B Moscow VETERINARIYA in Russian
No 1, Jan 94 (signed to press 24 Dec 93) pp 25-28

[Article by O. I. Getmanskiy and R. Ya. Karimov, Central Asian Foot and Mouth Disease Institute, under the rubric "Infectious Diseases"; UDC 619:616.988.43-036.2:636(575)]

[FBIS Translated Text] We have long since known about FMD [foot and mouth disease] among animals in the Central Asian region and it continues to be recorded annually. The continuous problem in this region is attributable to circulation of several types of the pathogen among naturally susceptible animals, its persistence in the environment and periodic penetration of the virus from adjacent states, as well as regions where FMD was widespread [1-9].

S. N. Anastasyan [2], who studied regional epizootiology of FMD, established that the range of the pathogen covered a vast territory including all republics of Central Asia, as well as some parts of Kazakhstan. In determining this pattern, the author identified the epizootic center of the range and marginal zone, in which the course of FMD epizootics differed appreciably.

The disease was consistently recorded in the epizootic center of the range, which is attributable to continuous illness of more or less large groups of susceptible animals. In the marginal zone of the range, the epizootic process was manifested in the form of epizootics due to penetration of the pathogen which ceased with decline of epizootic potential or in the absence of conditions for its spread.

All measures for FMD in Central Asia can be divided into two periods. In the first period they were based on quarantine and restrictive measures with use of artificial or spontaneous re-infection. The epizootic process had a wavy pattern manifested by dramatic rise followed by decline in number of stricken animals, presence of very vivid epizootic and inter-epizootic periods.

In the second period, FMD vaccines began to be used for control and prevention, and manifestation of the disease changed dramatically. In recent years, FMD has lost its epizootic nature and occurs in the form of local enzootics or sporadic outbreaks.

The range system of livestock farming was instrumental to a considerable extent in the permanent FMD problem in the region. Favorable climate, vast high-altitude or desert grazing land permit animal grazing the year round. As a rule, the winter pasture lands are situated tens and hundreds of kilometers away from the summer ones, so that there is an enormous number of animals traveling along driving itineraries, which are in constant contact with cattle near their route. The difference in FMD-related epizootic status often causes onset and spread of the disease.

A study of the epizootic process when there is mass spread of infection revealed several patterns and permitted purposeful implementation of a set of FMD-control measures. Adoption of new vaccines, which are constantly being improved, for preventive and compulsory purposes, combined with general organizational-management and veterinary-sanitary steps have led to improvement of the epizootic situation.

At first, the animals were vaccinated mainly as a compulsory measure at sites of infection and in threatened zones. Then preventive immunization of cattle with monovalent biologicals over the entire territory was adopted on a broad scale. Morbidity among cattle dropped significantly, but small, horned livestock was stricken. In most cases FMD was asymptomatic and of short duration in sheep and goats, but it constantly maintained populations of the pathogen and, in the presence of nonimmune animals, the disease also occurred in other species of susceptible animals.

Adoption of the practice of preventive immunization of small horned livestock made it possible to "break" one more link in the epizootic chain, and the morbidity situation improved. However, use of monovalent vaccines with constant circulation of several types of the pathogen did not improve the FMD situation, since establishment of an immune barrier to one type of the virus did not prevent the spread of another type.

After using bi- and tri-valent vaccines, morbidity dropped dramatically among cattle and small horned livestock, but the role of swine in the epizootiology of infection increased. Swine breeding changed to an industrial basis, the concentration of animals increased and "penetration" of the FMD pathogen led to illness of a large number of animals. Use of emulsified vaccines on this animal species made it possible to solve this problem too.

Recently, there has been an increase in number of unregistered animals in the private sector and specialized cooperatives; there has been very marked intensification of purchase and sale of livestock at markets. The veterinary service is not able to effect constant and scheduled monitoring of FMD-control steps because of the flaws in them.

It has not been established that there was marked seasonal manifestation of FMD when statistics for the last 50 years were compared. However, during the period when animals were not immunized and in the first decade of using FMD vaccine, most cases of FMD among livestock occurred in the spring-summer and fall. Appearance of new problem spots in the spring and summer was related to distinctive ways of livestock farming.

In Central Asia, formation of herds and flocks occurs in March-April; mass cattle drives to summer pastures starts in May, and to winter ones—in September-October. During the period of formation and particularly on the drive routes there is contact between immunologically and epizootiologically different animal

groups, which leads to rise in morbidity in the summer and fall-winter grazing lands.

A study of the course of infection revealed that FMD occurred from June to November. Thus, the average figures for number of problematic sites and sick animals (as related to total number) constituted 27.0 and 13.7 percent, respectively in the first quarter, 20.4 and 14.8 percent in the second, 19.2 and 41.5 percent in the third, and 33.3 and 29.9 percent in the fourth. In recent years, this pattern disappeared, and isolated problem spots and local enzootics can occur at any time of the year.

It is very difficult to determine the factors of spread of infection during periods of abatement of epizootics. This is attributable, first of all, to the fact that most animals were vaccinated twice a year for the last two decades, and for this reason the disease is manifested in mild and discrete forms. This makes it difficult to provide a timely diagnosis, as a result of which steps to curb and eradicate an FMD site are carried out with delay and the infection spreads. Contact between sick and susceptible cattle is the chief cause of FMD spread in Central Asia, as established in 37.8 [percent] of all new outbreaks. While contact occurred along the driving routes in prior years, more recently they occur as a result of traditionally established barter, trade and migration of animals that belong to the public.

The second chief factor in the spread of FMD is penetration into the region with people and transport as a result of interfarm ties between a problem spot and threatened zone; this route was established in 24.8 percent of the cases.

Transmission of FMD pathogen with infected slop was noted in 13.5 percent of the cases, and it is typical when the routes of pathogen travel to swine-breeding farms are established. Factors involved in spread of the disease were not reliably determined in 19.8 percent of the cases.

It is assumed that there are conditions that favor preservation of the virus in periods between epizootics, in the form of latent infection, and this presents a real danger of various epizootic situations.

Several types of FMD virus have been recorded in Central Asia and Kazakhstan, but there is prevalence of type O.

Whether susceptible animals contracted the disease or not depended on organization of FMD-control steps in the region. Before vaccination, the morbidity index per 100,000 head was up to 2065.6 at the time of maximum number of stricken animals, whereas in the last 5 years it constitutes 10.7.

At the present time, the set of FMD-control measures in Central Asia is based on preventive vaccination of susceptible livestock and general veterinary-sanitary

measures. Adult cattle is vaccinated twice a year, and young stock every quarter. The dates for inoculations conform to the system of running the livestock facility. All livestock is treated in March-April and September-October, while booster shots and revaccination of young stock are administered in June and December.

All small horned livestock is vaccinated in the spring before drives to summer pastures, whereas young stock is revaccinated in the fall. Swine in complexes and large farms are inoculated twice a year, in the spring and fall, in regions with high risk of FMD.

Depending on the epizootic situation, bivalent or polyvalent vaccine is given to ruminants, and monovalent to swine.

The complicated system of preventive vaccination and development of brief immunity are a retarding factor in achieving full eradication and obtaining stable well-being of herds with respect to FMD in Central Asia.

Adoption of a universal vaccine, the same one for all species of even-toed ungulate animals, capable of inducing immunity lasting for more than one year after single administration, will not only optimize implementation of preventive steps, but also make possible eradication at earlier stages of appearing sites and preclude spread of the disease.

At the present times, the methods of controlling FMD have changed substantially. In some countries, sick animals and those in contact with them are destroyed, without using vaccine; in others, the slaughtering method is combined with compulsory immunization; in others yet, preventive and compulsory inoculations are given in conjunction with sanitary-quarantine measures.

Evidently, in the Central Asian region it is necessary to reduce the zones of preventive immunization, whereas upon timely detection of isolated sites and in regions where there is a permanent threat, universal vaccine should be used. There must also be provisions to have a constantly replenished supply of vaccines that offer rapid protection, to perform high-speed diagnostic tests, to destroy immediately the first sick animals, and implement rigid quarantine and restrictive measures.

Conclusion. Investigation of the epizootic process with mass spread of foot and mouth disease made it possible to discover several patterns. Previously, the process occurred in waves, manifested by dramatic rises and then declines in number of sick animals, presence of pronounced epizootic and inter-epizootic periods. In recent years, with the adoption of new vaccines, FMD is no longer epizootic, and it is manifested in the form of local enzootics or sporadic outbreaks. On this basis, it is necessary to reduce the zone of preventive immunization and provide for a reserve of vaccines that elicit rapid protection.

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Specificity of Cytopathogenic Action of Diphtheria Toxin in vitro

947C0389 Moscow USPEKHI SOVREMENNOY BIOLOGII in Russian Vol 114 No 1, Jan-Feb 94 pp 96-109

[Article by V. V. Mikhaylov, Moscow Medical Stomatological Institute imeni N. A. Semashko; UDC 615.9-07]

[FBIS Abstract] Diphtheria is a disease that typically combines selective damage to the sympathoadrenal system, the heart, and the blood vessels. The fact that tissue damage in diphtheria stems exclusively from the action of the diphtheria toxin prompted a number of studies of the cellular-molecular mechanisms of action of the diphtheria toxin in vitro. The researchers here found that the toxin does, indeed, have all the properties of the toxic proteins group. Inactivation of the EF-2 elongation factor is a standard link in the mechanism of damage done to cells by toxic proteins that have a given molecular structure. They point out, however, that there is something of a crisis in the theory of the cytopathogenic action of the toxin, inasmuch as the existing data on the action of the toxin in vitro do not explain the specific nature of diphtherial toxin infection. References 124: 9 Russian, 115 Western.

Statute on Veterinary Department of RF Ministry of Agriculture

947C0392A Moscow VETERINARIYA in Russian No 2, Feb 94 (signed to press 24 Jan 94) pp 3-6

[Statute approved by decree of Council of Ministers—Government of Russian Federation, dated 16 November 1993]

[FBIS Translated Text]

1. The Veterinary Department of the Russian Federation Ministry of Agriculture (hereafter referred to as Veterinary Department) was formed on the basis of the Russian Federation law "On Veterinary Medicine."

2. The Veterinary Department is a structural subdivision of the Russian Federation Ministry of Agriculture that organizes the activities of the veterinary service of the Russian Federation dealing with prevention of animal diseases, monitoring production of high-quality and safe, from the veterinary point of view, livestock industry products and providing protection of the public against diseases common to man and animals.

3. Veterinary research institutes, veterinary laboratories, epizootic-control brigades and expeditions, zonal administrations of State veterinary oversight at State frontiers and transport, veterinary monitoring service at enterprises that process and store livestock products, and other veterinary institutions are subordinated to the Veterinary Department.

4. The Veterinary Department is governed in its work by the Constitution of the Russian Federation, Russian Federation law "On Veterinary Medicine," other legislative instruments, ukases and instructions of the president of the Russian Federation, orders, decrees and instructions of the Council of Ministers—Government of the Russian Federation, orders and instructions of the Russian Federation Ministry of Agriculture, as well as this Statute.

5. The main tasks for the Veterinary Department are to:—develop and implement special-purpose federal programs for prevention and eradication of quarantinable and particularly dangerous animal diseases, plans for veterinary servicing of the livestock industry and release of products that are safe from the veterinary point of view;—participate in forming federal programs for the training of veterinary specialists, production of agents and carrying out technical studies on veterinary problems;—monitor adherence to Russian Federation veterinary legislation by executive government agencies and officials, enterprises, institutions, organizations, other economic entities, regardless of their subordination and forms of ownership, public associations, international organizations, foreign legal entities, citizens of the Russian Federation, foreign citizens and individuals without citizenship who own animals and livestock products (hereafter referred to as enterprises, institutions, organizations and citizens);—protect the territory of the Russian Federation against penetration from other countries of contagious diseases of animals;—organize and improve effectiveness of state and agency veterinary-sanitary oversight.

6. In accordance with the tasks put to it, the Veterinary Department:—organizes forecasting, development of programs for prevention and eradication of animal diseases, establishes procedures for veterinary-sanitary

expert evaluations and certification of animal products and raw materials, and organizes monitoring of their implementation, as well as provides for veterinary protection of animals and the environment;

- interacts with agencies of sanitary and epidemiological oversight in carrying out activities related to protection of the public against diseases common to man and animals, and prevention of food poisoning;
- defines the list of quarantinable and particularly dangerous diseases, provides instructions that are mandatory for all individuals concerning slaughter or destruction of animals in the presence of particularly dangerous contagious diseases on the list approved by the Veterinary Department;
- prohibits operation of livestock farms, enterprises in the meat and dairy industry, enterprises that process and store animal products and raw materials in the event of discovery of contagious animal diseases or determination of unsatisfactory veterinary-sanitary condition of the above entities and enterprises prior to implementation of necessary veterinary-sanitary and epizootic-control measures;
- records veterinary statistics related to diseases of livestock, offers suggestions, following established procedure, on improvement of record-keeping and accountability in veterinary matters;
- monitors implementation of veterinary preventive measures by enterprises, institutions, organizations and citizens, their adherence to existing veterinary rules, takes steps to suppress infractions of RF veterinary legislation;
- monitors export, import, and transit transportation (drives) of animals, animal products and raw materials, fodder, biological, chemical-pharmaceutical agents, and other shipments subject to inspection;
- monitors implementation of measures to protect the territory of the Russian Federation against penetration of contagious animal diseases from foreign countries;
- develops veterinary rules and other enforceable enactments that are mandatory for livestock farming, animal upkeep, production, storage, transportation and sale of livestock products;
- supervises the work of the veterinary pharmacological council and commission for biological agents;
- studies and generalizes domestic and foreign know-how in organizing a state veterinary service; offers suggestions, following established procedure, on improvement of veterinary activities with consideration of changes occurring in the economy;
- takes steps to improve the performance of laboratories and identification of animal diseases;

—supervises state certification and registration of domestic and imported agents and equipment used for veterinary purposes; develops a system for standardizing and certifying them; issues permission for their production and sale; forbids production and revokes previously issued registration certificates if an agent has an adverse effect on animals;

—submits, following established procedure, conclusions pertaining to inventions; tests and adopts inventions and innovative proposals in the field of veterinary medicine;

—creates special brigades (groups) in subordinate veterinary research institutes and other veterinary institutions to render expert veterinary care when carrying out unscheduled epizootic-control and veterinary-sanitary measures under special conditions and in extreme situations, coordinates their work and supervises implementation of veterinary measures to eradicate involved sites and zones;

—forms the necessary reserve of biological and therapeutic agents, disinfectants and material-technical resources at biological enterprises and bases of zooveterinary supply;

—monitors storage and use of strains of microorganisms at research and production institutions, organizations and enterprises. Grants permission for import to the Russian Federation and export of strains of pathogens of animal diseases; grants permission to research institutes and other institutions to obtain virulent cultures of pathogens of quarantinable and particularly dangerous animal diseases;

—examines and coordinates the standards for technological design of livestock complexes, poultry processing plants, meat-packing plants, other enterprises dealing with processing of livestock products, and production buildings, with consideration of their conformity to veterinary-sanitary requirements, and organizes monitoring of adherence to these requirements during construction of such facilities;

—prepares plans for funding veterinary-sanitary measures and estimates of upkeep expenses for veterinary institutions that are directly subordinated to the Veterinary Department.

7. The Veterinary Department distributes limits on centralized capital investments issued from the Russian Federation budget and other sources of funding earmarked for construction, reconstruction of the production-technical base of institutions of the Russian Federation state veterinary service, research institutes, as well as for acquisition of specialized veterinary equipment, instruments and laboratory equipment.

8. Following established procedure, the Veterinary Department offers suggestions as to size of allocations from the Russian Federation budget needed to carry out

epizootic-control measures in agricultural enterprises, regardless of form of ownership.

9. The Veterinary Department is headed by a chief who is appointed to this position and relieved from this position by the Council of Ministers—Government of the Russian Federation.

The chief of the Veterinary Department is also the chief state veterinary inspector of the Russian Federation.

10. The chief state veterinary inspector of the Russian Federation and his deputies wear a uniform when performing their duties.

Samples of uniforms are approved by the Russian Federation Ministry of Agriculture, in agreement with the Russian Federation Ministry of Finance.

11. The chief of the Veterinary Department—chief state veterinary inspector of the Russian Federation:

- organizes the work of the Veterinary Department, is personally responsible for execution of tasks put to him; delegates duties among his deputies and section chiefs, approves statutes about sections (administrations) of the Veterinary Department;
- coordinates work of the Veterinary Department and main administrations, administrations, sections and other structural subdivisions of the Russian Federation Ministry of Agriculture;
- offers suggestions, in accordance with the approved list of positions, concerning appointments and dismissals of Veterinary Department employees; appoints and dismisses administrators of veterinary institutions under the direct jurisdiction of the Veterinary Department; offers suggestions following established procedure, and also resolves questions of incentives for employees of the Veterinary Department and imposition of disciplinary fines;
- represents the Veterinary Department in matters within its competence in all state and public institutions, enterprises and organizations, arbitration court, and court without any special power of attorney; issues powers of attorney (including the right to transfer them), and also concludes economic agreements on behalf of the Veterinary Department;
- is the administrator of funds allocated for epizootic-control measures and of centralized capital investments. He determines, within the limits of allocations, the structure, number of employees, estimates of expenses, as well as procedure for awarding prizes to employees of subordinate organizations.

12. Appointments to positions and releases from positions of the administrators of territorial agencies of the state veterinary service of the Russian Federation are carried out by the appropriate executive agencies in

agreement with administrators of superior agencies of administration of the Russian Federation state veterinary service.

13. The Veterinary Department has a seal with its name and the State emblem of the Russian Federation.

Open letter

The editorial office received a request from a group of veterinary specialists of Kemerovo Oblast to publish an open letter on matters of reorganization of the veterinary service in the Russian Federation:

The team of the Kemerovo Oblast Center for the Control of Animal Diseases and Kemerovo Oblast Veterinary Laboratory read the open letter of veterinary specialists of Turgay Oblast to deputies of the Supreme Soviet of the Republic of Kazakhstan (VETERINARIYA, No 9, 1993) and fully agrees with their specific proposals to change the draft "Law on veterinary service of the Republic of Kazakhstan." Many years of practical experience convinces us that until the state veterinary service becomes independent, its deficiencies and absence of rights will persist.

Veterinary specialists in the state veterinary network and particularly at farms, cannot really perform their duties so long as they are directly dependent on economists and local agencies of executive power.

The "Law on Veterinary Medicine" of the Russian Federation adopted on 14 May 1993 does not provide for complete independence of the veterinary service, and for this reason old problems remain unresolved, and this has a devastating effect on veterinary servicing of the livestock industry and creates the threat not only of rise in animal morbidity, but to human health.

We propose the following amendments to the "Law on Veterinary Medicine" of the Russian Federation:

1. To establish a unified state system of veterinary medicine—a ministry or committee of veterinary medicine to implement effective monitoring of quality of running livestock farms and servicing farms and enterprises on the basis of contracts and agreements.
2. To give the veterinary service the same rights as the Ministry of Health, with direct subordination to the republic's cabinet of ministers.
3. To elaborate a new draft RF law on veterinary medicine with mandatory participation of practicing physicians, to put it up to broad discussion, and submit it for approval to the new parliament of Russia.

[Signed by 39 veterinary specialists of Kemerovo Oblast.]

Epizootic and Epidemic Situation for Trichinosis in the Former USSR

947C0392B Moscow VETERINARIYA in Russian No 2, Feb 94 (signed to press 24 Jan 94) p 34-36

[Article by A. S. Bessonov, All-Russian Institute of Helminthology imeni K. I. Skryabin; UDC 619:995.132.6]

[FBIS Translated Text] According to published data (A. S. Bessonov, 1985, 1988), in the late 1970's—early 1980's there was firm stabilization of swine trichinosis (1-5 infected carcasses per million tested) and decline in its incidence among humans. In 1983-1987, the epizootic situation for trichinosis worsened, due to partial reorganization of agriculture (creation of small ancillary and leased farms, inappropriate upkeep and feeding of swine). This trend has also been evident in recent years, in connection with the change to a market economy, permission for free trade of meat at other than markets and shops, and reorganization of large collective farms into small private ones with obsolete technology, inadequate supply of feed and poor knowledge in sanitary-veterinary science.

The purpose of this article was to offer an analysis of the epizootic and epidemic situation for trichinosis in the former USSR, and to determine the causes of changes in 1988-1992.

Distribution of Trichinosis. *Trichinella* infection of jackals (to 80 percent), stone martens (56.6 percent), red foxes (to 22 percent), domestic cats (3.7 percent) and common field mice (1.8 percent) is recorded in Georgia (B. Ye. Kurashvili et al., 1988); wolves in Armenia (Ye. G. Manucharyan, A. M. Asatryan, 1992); wolves (7.7 percent), jackals (30.1 percent) and foxes (20 percent) in Azerbaijan (I. A. Sadykhov, M. Sh. Yelchuyev, 1988). Corsac foxes (13.4 percent) and foxes (8.6 percent) are infested in northern Kazakhstan (A. I. Batkayev, V. G. Vakker, 1992); foxes (18.2 percent), wolves (16.2 percent), raccoon dogs (14.1 percent), pine martens (7.3 percent), boars (0.07 percent) and mouse-like rodents (0.44 percent) in Belarus (O.-Ya. L. Bekshi, T. M. Odintsova, 1992); wolves (22.2 percent), foxes (9.29 percent), pine martens (3.85 percent), black polecats (2.38 percent), brown [Norway] rats (5.28 percent), domestic dogs and cats (5.7 and 6.2 percent respectively) in western and southern Ukraine (N. A. Kulikova, L. P. Yaluga, 1989; A. D. Timchenko, I. I. Zakharchuk, 1992).

Natural trichinosis is widespread in the Russian Federation: in wolves (35.7 percent), raccoon dogs (22 percent), field mice (0.8 percent) and boars (0.66 percent) in Moscow Oblast (R. A. Penkova, N. I. Ovsyukova et al., 1988); in wolves, foxes, black polecats, domestic cats, house and field mice, brown rats and European hedgehogs in Penza Oblast (A. P. Machinskiy, Yu. K. Gorbov, 1992); in boars, brown rats, domestic dogs and cats in Kaliningrad Oblast (S. A. Nagornyy et al., 1992); in foxes (36.4 percent), jackals (18.2 percent), raccoon dogs (64.9 percent), European brown bears (to 89.5 percent), boars (to 25 percent), pine martens (26 percent), wildcats (64.1 percent), wolves (9 percent), domestic cats and dogs (to 15.7 and 15 percent, respectively), brown rats (4.7 percent) and mouse-like rodents (to 5.4 percent) in Krasnodar Krai, North Osetian Autonomous Republic, Karachay-Circassian Autonomous Okrug, and Adygeya (N. Ye. Murashov et al., 1988; S. A. Nagornyy, A. N. Kudaktin, 1988; A. U. Pigolkin, V., A. Bokun, 1992; A.

Ya. Sapunov, V. G. Andryushchenko, 1992); in domestic dogs (28.6 percent) and cats (14.3 percent) in Rostov Oblast (M. A. Popov et al., 1988); in wolves, raccoon dogs, European hedgehogs, pine martens, badgers and domestic cats in Voronezh Oblast (V. A. Romashov, B. V. Romashov, 1992); in wolves (54.17 percent) and foxes (12 percent) in Mordovia (A. P. Machinskiy et al., 1988).

In Asian parts of Russia, natural trichinosis prevails in taiga animals: brown bears (39.2 percent), stoats (7.1 percent), wolves (15.3 percent), foxes (33.3 percent), weasels (7.1 percent), Siberian weasels (3.1 percent), sables (1.8 percent) in Irkutsk Oblast (M. M. Kolokol'tsev et al., 1988); brown bears (32.4 percent), foxes (20 percent), wolves (8.7 percent), raccoon dogs (11.4 percent), lynx (7.7 percent), boars (6.6 percent), stoats (5.8 percent), weasels (7.1 percent), Siberian weasels (9.3 percent), sables (3.2 percent), mink (2.4 percent), domestic dogs and cats (18.2 and 9.3 percent, respectively), mouse-like rodents (0.08 percent) along the Baykal-Amur Railroad (A. S. Dovgalev et al., 1988); raccoon dogs (53.66 percent), foxes (42.8 percent), Siberian weasels (26.3 percent), sables (7 percent) in Amur Oblast (L. A. Guba, I. A. Faynfeld, 1988); brown bears in Buryatia (D.-S. D. Zhaltsanova, R. R. Khalina, 1922 [sic]; wolves, tigers, sables (2 percent), foxes, raccoon dogs, mink (1 percent), Siberian weasels (5 percent), brown bears (30.5 percent) in Maritime and Khabarovsk krais (N. M. Gorodovich et al., 1988); wolverines, brown bears (25 percent), foxes (9.3 percent), sables (1.92 percent), domestic dogs (to 30 percent) and cats (13.3 percent), brown rats (1.3 percent) in Kamchatka Oblast (N. A. Tranbenkova, 1992).

Instituted measures and decline in number of wild animals in the western part of the former USSR were instrumental in reduction of incidence of natural trichinosis in the last 15-20 years on the territory of Belarus (infestation of domestic cats dropped from 17.2 to 4.7 percent, brown rats from 2.93 to 0.54 percent, house mice from 0.3 to 0 percent, raccoon dogs from 33.4 to 22.2 percent, foxes from 32.5 to 7.9 percent, boars from 0.37 to 0.12 percent) and Ternopol Oblast in Ukraine (A. A. Bogush, 1988; N. A. Kulikova, L. P. Yaluga, 1989).

It has also been reported that local animal species play the leading part in spread of infestation in different regions. In North Caucasus it is the brown bear and wildcat, in Trans-Caucasus—the jackal and stone marten, in Ukraine, Belarus and central Russia—foxes and wolves; in Siberia and the Far East—brown bears, raccoon dogs and foxes. In some local zones, hunting dogs (Kamchatka Oblast), Corsac foxes (northern regions of Kazakhstan), small predators, particularly Siberian weasels and pine martens (Far East, North Caucasus) play a large epizootiological role.

Infestation of predators with trichinella is higher near cities (B. Ye. Kurashvili, 1988).

Swine Trichinosis. This disease is distributed in virtually all regions, with the exception of Turkmenia, Uzbekistan, Tajikistan and Azerbaijan, with predominantly

muslim population. Infestation is lowest in Belarus, which was previously considered to have a trichinosis problem: 1 infected carcass out of 2,200,000 examined (A. A. Bogush, 1988). There is 0.09-0.5 percent trichinella infestation of swine in Georgia (B. Ye. Kurashvili, 1988), and a few farms have a problem with this in Rostov Oblast (M. A. Popov et al. 1988). Trichinosis is regularly detected in Ukraine (V. N. Dzikovskiy, 1992; A. D. Timchenko, I. I. Zakharchuk, 1992), Georgia (G. I. Goderdzishvili et al., 1988), Lithuania (S. K. Bizyulyavichus et al., 1992, Krasnodar Kray (A. Ya. Sapunov, V. G. Andryushchenko, 1992) and a few other regions, and there are sporadic cases in Armenia (Ye. G. Manucharyan, A. M. Asatryan, 1992), Tula and Moscow oblasts (R. A. Penkova et al., 1988), Stavropol Kray (A. U. Pigolkin et al., 1988), and Buryatia (D.-S. D. Zhaltanova, R. R. Khalina, 1992).

An increased infestation of swine with trichinella, related to changes in forms of ownership and technology of animal upkeep, is reported in Lithuania (S. K. Bizyulyavichus et al., 1992), Krasnodar Kray (from 0.01 to 0.073 percent in the last 15 years) (A. U. Pigolkin, V. A. Bokun, 1992; L. N. Shipkova, 1992), southern Ukraine (A. D. Timchenko, I. I. Zakharchuk, 1992) and Georgia (G. I. Goderdzishvili et al., 1988).

Appearance of swine trichinosis sites in previously unaffected zones was unexpected and dangerous. Thus, the disease was first recorded in Kaliningrad Oblast in 1981, and at present its incidence is 0.069 percent (S. A. Nagornyy et al., 1992); in Kamchatka Oblast (suburbs of Petropavlovsk-Kamchatskiy, to 0.5-0.75 percent) in 1987 (N. A. Tranbenkova, 1992). In 1988, the first cases of swine trichinosis were found in the private sector in Norilsk industrial rayon of Krasnoyarsk Kray that is situated in the tundra zone (A. I. Rudkovskiy, R. R. Khalina, 1992).

Mountain and forest swine farming (free grazing of pigs in the forest), which is widespread in North Caucasus (mainly Krasnodar Kray), Georgia and, in part, Maritime Kray, is specific to some regions. Privately owned swine, which graze in forests of the Caucasus, are up to 2.6-6.3 percent infested with trichinella (S. A. Nagornyy, A. N. Kudaktin, 1988).

Human trichinosis. Sporadic cases of trichinosis among people who consume pork and venison (mainly bear and boar meat) are recorded in Bashkortostan (G. Z. Khaziyev et al., 1988), Buryatia (D.-S. D. Zhaltanova, R. R. Khalina, 1992), Kaliningrad Oblast (S. A. Nagornyy et al., 1992), Norilsk industrial and other regions of Krasnoyarsk Kray (N. G. Kuznetsov et al., 1988; A. I. Rudkovskiy, R. R. Khalina, 1992), and Kherson Oblast of Ukraine (S. N. Dmitriyev et al., 1991). There has been a rise in incidence of the disease in Georgia, particularly its eastern parts (G. M. Maruashvili et al., 1988; G. G. Badashvili et al., 1992; L. M. Zirakishvili et al., 1992), Lithuania (it doubled between the early and mid-1980's)

(V. P. Bagdonene et al., 1988; S. K. Bizyulyavichus et al., 1992), as well as north-eastern and central Russia (N. N. Ozeretskovskaya, 1988).

The trichinosis epidemic season usually coincides with the time of mass slaughtering of swine by private owners and the wild animal hunting season (October-March). In Georgia, it is quite extended. Thus, in 1991, 47 percent of the patients contracted trichinosis between April and September (L. M. Zirakishvili et al., 1992). In Krasnodar Kray, the main epidemic season is from December to February (about two-thirds of the cases), and additionally in March-May. Of all recorded cases, 66.4 percent are located in four mountain and foothill regions of this kray (N. Ye. Murashov et al., 1988).

Swine are the main source of the pathogen of infestation in man in Ukraine (up to 74 percent of all cases) (N. A. Kulikova, L. P. Yaluga, 1989; S. N. Dmitriyev et al., 1991; V. N. Dzikovskiy, 1992) and Belarus (up to two-thirds) (Yu. S. Kleyn, A. A. Vedenkov, 1992), central Russia (R. A. Penkova, Z. A. Oshevskaya, 1992) and Krasnodar Kray (82.5 percent) (N. Ye. Murashov et al., 1988). Highest incidence after consuming boar meat (80 percent) was reported in Lithuania (S. K. Bizyulyavichus et al., 1992) and Latvia (M. A. Lazdinya, V. M. Nesaule, 1989). In recent years, swine and boars are sources of trichinella to an equal extent in Lithuania (V. P. Bagdonene et al., 1989) and Latvia (I. Ya. Vingre, T. A. Akinova, 1989; Bajoriniene, 1990). Field isolates of trichinella (particularly ursine) have become the chief cause of human trichinosis in Siberia and the Far East of Russia.

Analysis of 522 trichinosis cases in the zone of the Baykal-Amur railroad revealed that 67.9 percent of the patients were geologists, hunters and their family members. In 94.3 percent it was caused by consumption of venison, including brown bear meat in 87.7 percent (A. S. Dovgalev et al., 1988). Brown bear meat was the cause of all human cases of the disease in Krasnoyarsk (V. G. Kuznetsov et al., 1988). In Maritime Kray, swine and the brown bear were responsible to virtually equal extent for human trichinosis cases (43.2 and 38.8 percent of cases, respectively) (V. A. Britov, L. F. Nakoryakova, 1988). In the last 15 years, there has been a 2.4-fold increase in trichinella infestation of bears in Irkutsk Oblast (M. M. Kolokoltsev et al., 1988).

There has been considerable redistribution of human trichinosis in the former USSR. While 82.9 percent of all cases were found in Belarus, 7.56 and 7.03 percent in Ukraine and Russia, respectively, in the early 1970's (A. S. Bessonov, 1972), at the present time, when scaled to 10,000 population, Lithuania is in first place in morbidity (3.81 percent), followed by Georgia (1.24 percent), Russia (0.15 percent), Belarus (0.14 percent) and Ukraine (0.07 percent). Human trichinosis was recorded in Tajikistan and Turkmenia (N. N. Ozeretskovskaya, 1988).

The incidence of trichinosis among boars (particularly in the Baltic region and Caucasus), bears (Caucasus, Siberia

and the Far East), as well as human infestation by consumption of coypu meat in Krasnodar and Maritime krais (V. A. Britov, L. F. Nakoryakova, 1988; L. N. Shipkova, 1992), are indicative of considerable epidemiological danger of these animals and probability of its increase in the future.

Natural trichinosis can change into the synanthropic form with involvement of swine (epidemiologically the most dangerous animals), which is probably what happened in Norilsk industrial region and suburbs of Petropavlovsk-Kamchatskiy. Invasion from another region is unlikely, since local swine farming was developed there long ago.

The change in trichinosis epidemic season causes an increase in infestation of urban residents via trichinella-infested meat (salt pork, smoked meats, and others) sent by relatives from villages or sold at city markets. It is, so to speak, artificially extended by the time required to process cured pork, as well as storage, shipment and sale (A. S. Bessonov, 1972).

Conclusion. The epizootic and epidemic situations for trichinosis in the former USSR worsened in 1988-1992. The causes are: impairment of technologies used in swine farming; reorganization of large collective farms with predominantly closed type of upkeep and dry, concentrate type of feed into small private farms with obsolete technology, insufficient feed and poor knowledge in veterinary and sanitary matters; permission of free trade other than in markets and stores.

Hemorrhagic Fever With Renal Syndrome in the Structure of Endemic Morbidity in Southern Khabarovsk Kray and Its Social Significance

947C0370A Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 5, Sep-Oct 93 (manuscript received 16 Apr 91, with revisions 12 May 92) pp 43-46

[Article by Yu. N. Sidelnikov], Khabarovsk Medical Institute; UDC 616.61-002.151-036.21-078(571.62)

[FBIS Translated Text] The southern regions of Khabarovsk Kray, including the southern part of the Jewish Autonomous Oblast (JAO) are sites of several endemic infections that constituted 5.8 percent of the cases in overall structure of infectious morbidity in the last 10 years according to data of the infectious disease clinic of Khabarovsk Medical Institute.

Material and Methods

The structure of endemic morbidity and share in it of hemorrhagic fever with the renal syndrome (HFRS) was determined on the basis of retrospective analysis. Age and social composition of 374 HFRS cases treated at a hospital was analyzed. Data pertaining to sanitary and

hygienic description of territories were used to demonstrate endemic factors that were compared to the results of epidemiological analysis.

Results and Discussion

In the last decade, HFRS along with pseudotuberculosis was in the lead in the structure of endemic morbidity (see Table 1). Prolonged hospitalization, use of expensive drugs (glucocorticosteroid hormones, agents with antienzymatic activity, blood substitutes, and others) and hemodialysis on 15.6 percent of the patients make this disease one of the most expensive at the infectious disease clinic. Mortality from HFRS constitutes 2.4 percent.

Table 1. Structure of endemic morbidity in southern Khabarovsk Kray

Nosological form	Percent of total hospitalized cases	Percent of endemic infectious morbidity	Total mean bed-days/year
Pseudotuberculosis	2.30	40.3	575.7
HFRS	2.00	34.2	807.9
Tick-borne typhus	1.20	20.5	186.4
Trichinosis	0.19	3.3	70.3
Leptospirosis	0.10	1.5	85.5
Rabies	0.01	0.2	2.6

There were 47 hospitalized HFRS patients treated between 1981 and 1990. Among the cases there was prevalence of males, who constituted 78.2 percent. The patients ranged in age from 15 to 72 years (mean 34.7+/-0.6 years: 34+/-0.6 years for males and 37.3+/-1.2 years for females).

The number of cases in the spring and summer (March to August) constituted 17.8 percent, while maximum morbidity was observed in October to December, when it constituted 72.6 percent (31 percent in November alone).

Of the total number of cases, 51.2 percent resided in rural regions adjacent to Khabarovsk and southern regions of JAO. The figure for residents of Khabarovsk proper was 46.5 percent of all cases. Residents of Amursk, Komsomolsk-on-Amur and Vyazemskiy were also treated.

The social composition of HFRS cases is tabulated in Table 2. As can be seen in this table, the unemployed constituted about 16 percent of the cases (pensioners, young students). Blue-collar workers made up most of the cases among both the rural and urban population. Among stricken women there was prevalence of white-collar workers.

Table 2. Social composition (percentages) of HFRS patients

Social group	Total (473)	Urban (231)	Rural (242)	Female (103)	Male (370)
Blue-collar workers	46.93	48.92	45.04	18.45	54.86
White-collar workers	19.66	22.94	16.53	34.95	15.41
Livestock breeders	6.34	0.87	11.57	16.50	3.51
Field-crop growers and machine operators	2.11	—	4.13	—	2.70
Poultry farmers	4.44	1.29	7.44	9.71	2.97
Not engaged in production	29.81	39.80	20.24	33.97	28.63
Lumberjacks and logging workers	1.90	0.89	2.89	—	2.43
Geologists	1.27	2.59	—	1.94	2.43
Bee-keepers	1.06	1.73	0.41	—	1.35

Note: Number of patients given in parentheses. [Translator's note: Some categories mentioned in text, such as pensioners and students, were omitted in source version of this table, although reference is made to it.]

Analysis of various factors involved in onset of HFRS revealed that more than one-third of the patients lived in wood houses (almost every other rural resident), and mouse-like rodents had been reported either in the home or ancillary buildings (storage sheds, basement, cellar, barn). Only 15 percent of the cases denied presence of rodents.

Evidently some urban residents were infected out of town: at dachas and truck gardens while performing agricultural work (which can be seen quite graphically on the example of morbidity of students at higher and secondary educational institutions); when working at vegetable bases, visiting relatives living in a rural area endemic for HFRS; while fishing, hunting, and attending military field assemblies [or training]. However, there was a real chance to become infected with HFRS virus in the work place for at least one-third of urban victims of the disease.

In a number of instances, it was quite difficult to determine the exact route of transmission of HFRS virus, in view of the combination of several factors: constant presence at an endemic site and performance of various jobs during which air-borne, as well as alimentary and contact routes of infection are possible. For most cases of HFRS, the most probable route was airborne-dust, considering the nature of work performed by the patients: working the soil, working with mixed feed, hay, straw, grain, inspecting old structures, objects, papers. One must also bear in mind that sweeping (more often performed by men) was carried out in both industrial and residential (at dachas) buildings.

The presence of rodent-tainted products was noted by only 5.7 percent of the patients, and they were consumed by 1.6 percent. Water from incidental sources was consumed by 4.3 percent of the patients.

Cases of direct contact with rodents were relatively rare—4.6 percent of the patients handled live or dead

rodents, 1.1 percent stomped on mice. In such cases, infection most likely occurred through the hands infected with HFRS virus when taking shoes off or putting them on.

Group HFRS infection was noted in 9.1 percent of the cases when the individuals lived, worked or spent leisure time together.

It is interesting to note that only 15 out of 72 interrogated had heard of HFRS, 4 knew about preventive measures and only 1 used a respirator when turning grain over with a shovel.

Thus, in the last decade, the incidence of HFRS in southern Khabarovsk Kray was rather high over the last 10 years, and this is related to the considerable concentration of rodents in the work place and residential buildings, contact of the public with endemic sites of the disease for job-related purposes (harvesting, laying-in fodder, etc.), development of suburban farming by urban residents.

The relatively young age of patients and their involvement in socially useful labor, prolonged stay in a hospital, additional out-patient treatment (for 10-14 days) are indicative of the considerable material loss caused by HFRS to industry of southern Khabarovsk Kray.

The high morbidity rate, marked seasonal pattern and social determination require further refinement of the system of nonspecific prevention of this disease, and first of all sanitary education of the residents of regions endemic for HFRS.

Conclusions.

1. Determination was made of the fact that hemorrhagic fever with the renal syndrome holds a leading place in the structure of endemic morbidity in southern Khabarovsk Kray over the last 10 years.

2. Various factors have been found, including social ones, that have epidemiological significance. The need for further improvement of the system of nonspecific prevention of this disease has been validated, considering the high incidence and social determination of hemorrhagic fever with the renal syndrome.

Distribution of Hepatitis C Markers Among Inhabitants of Some Regions of Russia and Central Asia

947C0370B Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian* No 5, Sep-Oct 93 (manuscript received 11 Jun 91, with revisions 25 Nov 91), pp 46-49

[Article by T. L. Yashina, M. O. Favorov, I. V. Shakhgildyan, D. M. Yarasheva, O. I. Nazarova, Ye. N. Derevyanko, M. I. Ommadova, G. G. Onishchenko, Yu. Watanabe, K. Nishioka, and D. K. Lvov, Institute of Virology imeni D. I. Ivanovskiy, Russian Academy of Medical Sciences, Moscow, and Japanese Red Cross Blood Center; UDC 616.36-002-02-036.2-07]

[FBIS Translated Text] Hepatitis C (HC), previously referred to as parenteral neither A nor B hepatitis, was diagnosed until recently on the basis of exclusion of other forms of viral hepatitis: hepatitis A (HA) and hepatitis B (HB). The commercial enzyme immunoassay test system for demonstration of antibodies to hepatitis C virus (HCV), developed in recent years by the ORTHO firm, made it possible to carry out specific laboratory testing for this infection [7]. This test system is used extensively abroad at the present time for investigation of clinical and epidemiological aspects of HC, to determine the incidence of anti-HCV in a population and different risk groups [3, 6, 8, 10, 11]. Such studies are only beginning in our country.

Our objective here was to determine the incidence of HC among inhabitants of different regions of Russia and Central Asian states on the basis of results of demonstration of specific antibodies.

Material and Methods

We tested 2217 blood serum samples from individuals ranging in age from 1 month to 70 years, from different parts of Russia (Moscow, Tuva, Yakutia) and Central Asia (Tajikistan, Kyrgyzstan, Turkmenia). concurrently, we tested 101 specimens of serum from Moscow blood donors with elevated alanine aminotransferase (AlAT). We tested all these samples for antibodies to C-100-3-antigen in a commercial HCV test system (ORTHO HCV Ab ELISA Test, Ortho Diagnostic Systems, Tokyo, Japan). Positive samples were retested. Most (66 out of 47 [sic]) anti-HCV positive serum samples were corroborated by using second generation recombinant immunoblot tests: CHIRON RIBA HCV (4-RIBA) with 4 HCV antigens (C-100-3, 5-1-1, C33c, C22c) immobilized on a nitrocellulose band from the ORTHO firm. Samples that reacted with two or more

antigens were considered positive (+), those reacting with only one antigen as doubtful (+/-), and those that did not react as negative (-).

Results and Discussion

Anti-HCV was demonstrated in 65 (2.9 percent) out of 2217 tested blood serum specimens from people in different regions. The incidence of these antibodies differed in different regions. The findings are listed in Table 1. Anti-HCV were demonstrated the most often (5.3 percent) among inhabitants of Turkmenistan; these antibodies were found in 3.9 and 2.9 percent of the inhabitants of Tajikistan and Kyrgyzstan, respectively, in 3.0 and 2.5 percent of tested individuals in eastern regions (Tuva and Yakutia). The incidence of demonstration of anti-HCV was lowest in Moscow, constituting 1.3 percent.

Table 1. Incidence of Demonstration of Anti-HCV Among Inhabitants of Different Regions of Russia and Central Asia

Region	Number of tests	Anti-HCV-ELISA	
		absolute	percent
Moscow	696	9	1.3
Tajikistan	284	11	3.9
Turkmenistan	391	21	5.3
Kyrgyzstan	588	17	2.9
Tuva	100	3	3.0
Yakutia	158	4	2.5

Concurrently, the incidence of antibodies to HCV among different Moscow population groups was analyzed. The results are listed in Table 2.

Table 2. Incidence of Anti-HCV Among Different Population Groups in Moscow

Group	Number of tests	Anti-HCV-ELISA	
		absolute	percent
Children, 0-14 years old	192	1	0.5
Pregnant women	172	2	1.3
Blood donors	327	6	1.8

Anti-HCV was found the least often in children: in 2 (0.5 percent) out of 192). This marker was found in 2 (1.2 percent) out of the 172 tested pregnant women. Anti-HCV was demonstrated in 6 (1.8 percent) out of 327 blood donors. It should be stressed that antibodies to HCV were demonstrated much more often in the donor group with elevated AlAT: in 9 (8.9 percent) out of 101 tested.

To confirm the specificity of the findings, 66 of the 74 anti-HCV-ELISA-positive specimens were submitted to

recombinant immunoblotting (4-RIBA). As can be seen in Table 3, 40 (70.1 percent) out of 57 serum samples from individuals from different regions that were anti-HCV-ELISA-positive were positive in the 4-RIBA,

another 4 (7 percent) were found to be doubtful (+/-) and 13 (22.8 percent) were negative. Among blood donors with elevated AlAT levels, all 9 (100 percent) positive samples were confirmed by 4-RIBA (see Table 3).

Table 3. Incidence of Confirmation of Anti- HCV-ELISA Positive Samples By Recombinant Immunoblotting

Anti-HCV-ELISA positive samples	Number of tests	Anti-HCV 4-RIBA		
		+	+/-	-
Healthy population	57	40 (70.1%)	4 (7.0%)	13 (22.8%)
Donors with elevated AlAT	9	9 (100%)	0	0
Totals	66	49 (72.4%)	4 (6.0%)	13 (19.7%)

Table 4 shows the correlation between 4-RIBA confirmation and optical density (OD) of anti-HCV-ELISA results. There was maximum frequency of confirmation of anti-HCV by 4-RIBA in samples with ELISA OD

greater than 2000 nm—91.2 percent, it constituted 61.1 percent with OD from 2000 to 1000, and only 50 percent with OD less than 1000.

Table 4. Confirmation of Anti-HCV-ELISA-Positive Sera By Recombinant Immunoblotting

OD 492 nm	Number of tests	Anti-HCV-ELISA		
		+	+/-	-
> 2000	34	31 (91.2%)	1 (2.9%)	2 (5.8%)
2000-1000	18	11 (61.1%)	1 (5.8%)	6 (33.3%)
< 1000	14	7 (50.0%)	2 (14.2%)	5 (35.7%)

The findings indicate that there are differences in distribution of HCV infection over different territories. It is more broadly distributed in Central Asia (5.3 percent in Turkmenistan, 3.9 percent in Tajikistan, 2.9 percent in Kyrgyzstan), as well as eastern regions of Russia (2.5 percent in Yakutia, 3 percent in Tuva). In the same regions there was a high level of HBsAg carriers, widespread HB and delta viral infection [1, 2]. Frequency of anti-HCV demonstration was lowest (1.3 percent) among inhabitants of Moscow. Unlike other territories, the level of HBsAg carriers and incidence of HB and HD were considerably lower in Moscow [2]. Thus, in many respects the patterns of distribution of hepatitis B, D and C coincide.

Anti-HCV was demonstrated at maximum frequency (8.9 percent) among blood donors with elevated AlAT levels, which is indicative of the importance of mandatory testing of donor blood for this substitute marker for viral hepatitis, including HC. Abstention from use of such donors definitely lowers the incidence of post-transfusion hepatitis; however, it does not preclude it entirely, since some HCV-infected donors present normal AlAT levels. The absence at the present time of specific detection of HCV infection in our country's blood service hinders prevention of post-transfusion hepatitis C.

In the opinion of a number of authors [5, 9], some of the demonstrated anti-HCV ELISA is attributable to false-positive results. Confirmation of anti-HCV-positive sera

by recombinant immunoblot tests makes it possible to rule out nonspecific reactions. In our work, anti-HCV ELISA-positive findings on blood serum of inhabitants of different territories were confirmed by recombinant immunoblotting in 70.1 percent of the cases (7 percent were doubtful). In the group of blood donors with elevated AlAT, positive specimens were confirmed in 100 percent of the cases. With use of first-generation RIBA (c100-3, 5-1-1), 30-50 percent of positive results were corroborated [4]. Evidently, additional use of new RIBA-4 antigens enhances sensitivity of this test. We were impressed by the fact that with decrease in optical density (OD 492 nm) the frequency of corroboration of ELISA findings decreases from 91.2 percent with OD greater than 2000 to 50 percent in specimens with OD less than 1000. Among anti-HCV ELISA-positive serum specimens with low optical density there is probably a higher frequency of false-positive findings. However, we cannot rule out the possibility that some of the specimens with demonstrated anti-HCV were not corroborated by RIBA due to inadequate sensitivity of this test.

Thus, testing blood serum of inhabitants of different regions for anti-HCV using the commercial enzyme immunoassay test system of the ORTHO firm revealed noticeable differences in distribution of HC in CIS states. Anti-HCV were found the most often (5.3-2.9 percent) among inhabitants of Central Asia, as well as Tuva and Yakutia (2.5-3 percent). Anti-HCV were demonstrated at the lowest frequency, 1.3 percent, in Moscow. These antibodies were demonstrated in half as

many children of Moscow as adults. The frequency of confirmation of anti-HCV ELISA-positive specimens by recombinant immunoblotting among the tested population constituted 70.1 percent, and in 100 percent of the donor group with elevated AlAT. It was established that the patterns of distribution of hepatitis B, D and C coincide in many respects.

Conclusions

1. Differences were found in frequency of demonstration of antibodies to hepatitis C virus in different regions. They were found the most frequently among inhabitants of Central Asia, Tuva and Yakutia, constituting 5.3-2.9 and 2.5-3 percent, respectively.

2. Antibodies to hepatitis C virus were demonstrated in 8.9 percent of blood donors with elevated alanine aminotransferase levels. The frequency of confirmation of antibodies in the donor group with elevated AlAT constituted 100 percent, whereas in positive serum samples from the tested population it was 70.1 percent with use of recombinant immunoblotting.

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How To Organize Coordination

947C0391A Moscow *ZASHCHITA RASTENIY*
in Russian No 12, Dec 93 pp 3-4

[Article by I. A. Shestopalov, deputy chief of Russian State Inspectorate for Plant Quarantine, under the rubric: "Problems, Search, Opinions"]

[FBIS Translated Text] In July of this year, the regular coordination conference on plant quarantine convened in Bishkek, capital of Kyrgyzstan, and was attended by administrators and specialists of state quarantine inspectors of CIS states and other states of the former Soviet Union.

In spite of prior arrangements and agreement of virtually all service administrators to convene expressly in Bishkek, as well as the attentive and concerned attitude toward preparing the conference on the part of the government and Kyrgyz Ministry of Agriculture, there were fewer participants than expected. State inspectorates of the Russian Federation, Kazakhstan, Uzbekistan, Turkmenistan, Moldova, Latvia and Estonia sent representatives. American grain suppliers, in particular the North American Association of Grain Exporters that represents 40 grain trade and fumigation companies, headed by Mr. S. McCoy, president of this association, displayed much interest in the meeting.

Financial problems related to adoption of national currencies and difficulties in exchange operations prevented attendance of representatives of inspectorates of other nations that signed the intergovernment Agreement on Plant Quarantine dated 13 November 1992. It is hoped that these are temporary problems and that collaboration in plant quarantine will develop and improve, since this is in the interest of all nations, as was stated with special concern at the conference.

The official agenda included discussion of four matters: informing national service administrators about the quarantine status of territories in their countries, progress in implementation of the intergovernment Agreement on Plant Quarantine dated 13 November 1992, elaboration and approval of decision on coordination of activities of state services in the area of plant quarantine in 1994, and discussion of practical problems that arise in relations between countries.

In fact, the range of issues discussed was much broader. Participants spoke about how to restore and develop reciprocal trade of agricultural products, which is presently in a sad condition, without waiving the quarantine requirements to protect their territories. The sorest points were problems of training specialists in plant quarantine, in view of the collapse of the unified system of zonal training courses, as well as of maintaining viability of fumigation services in the presence of dramatically worsened supply of methyl bromide, as well as inclusion of this fumigant in the list of ozone-depleting substances.

All of the participants without exception were also concerned about the poor coordination of actions of state quarantine services, particularly the fact that there is still no functional coordinating agency, establishment of which had been planned at the last conference in the fall of 1992.

The conference participants commented on weakening of quarantine inspection in all CIS states and other

independent states, as a result of which there is increased danger of bringing in quarantinable items along with imported shipments to each contracting country; diminished competence and qualifications of specialists due to collapse of the unified training system. In the opinion of administrators of national services, it is imperative to resume training on the CIS level in a centralized manner at the All-Russian Research Institute of Plant Quarantine and to provide funding for this center from resources of national plant quarantine services. There has been worsening of information support of quarantine services, including furnishing regular information about the condition of territories of independent states of the former Soviet Union and other countries in the world community.

Administrators of national services have deemed it desirable to join with all existing intergovernment agreements on plant quarantine in order to protect territories more effectively and obtain reliable information about the quarantine status of world countries. The question was raised of priority of furnishing national services with fumigants. In order to protect Central Asian republics against penetration of particularly dangerous quarantinable items it was deemed necessary to address the government of Turkmenistan with the request to establish inspection and fumigation services in the port of Krasnovodsk on the Caspian Sea.

In view of the particular interest of the United States in supplying grain and grain products to CIS states and the Baltic region, conference participants expressed their readiness to establish close collaboration with the North American Association of Grain Exporters, provided American suppliers will offer certain guarantees of quality of exported plant products with regard to quarantinable contents.

It was decided to hold the next coordination conference in the capital of Kazakhstan, Almaty, in September 1994.

The results of the conference in Bishkek revealed that national plant quarantine services of new independent states are still at the difficult developmental stage. With departure from centralized management, funding and support, they have not become full-fledged state services in the contemporary sense. In most of them, the organizational period was very difficult, and it is by far not everywhere that the authorities delve into the substance of the work and problems of quarantine services. This is attributable, to a considerable extent, to the fact that new people, who are not very familiar with the specifics of quarantine hold management positions in agricultural agencies of former republics, and some time will be needed for them adapt.

Some inspectorates, such as those in Turkmenistan, Tajikistan and Uzbekistan, are directly subordinated to government cabinets, which enables them to solve problems with various agencies, legal and physical entities. Others, for example in Kazakhstan and Ukraine, have

raised their state status, being on a par with the main administrations of central agriculture agencies. Others yet have retained their former status, that of organizations under the Ministry of Agriculture, although their functions have changed radically, including international relations, which requires appropriate powers. But, since the new structures of management agencies of former Union republics are still at the formative stage, some time is needed to come close to the classical form inherent in most developed countries, where the administrative element of the state service for plant quarantine (and protection) is within the apparatus of the ministry, while ancillary structures are in technical-research centers and institutes.

State inspectorates, with the exception of the Latvian one, are still not part of the plant protection services, and this has both its good and bad sides. Let us recall that in most world structures quarantine and protection of plants (and, in the United States, veterinary science too) are combined in a single service with common goals and tasks.

At the same time, national plant protection services have gained to some extent from decentralization. Having received greater independence, they have improved their financial and material situation. And this enables us to hope that things will improve after all.

However, and this was stressed by all conference participants, coordination and mutual aid are necessary and the general opinion is that it is best to use the All-Russian Research Institute of Plant Protection as a coordinating center. The financial status of most inspectors makes it possible to sponsor the operation of an information-coordinating center at this institute.

Our state services turned out to be isolated, not only from one another, but also from the world quarantine community. Only a few services participate to some extent in international collaboration; for example, membership in the European and Mediterranean Organization for Plant Protection was automatically retained only by Russia, and Estonia joined the organization 2 years ago. If information does come from abroad, it is rather limited, and it places the services in a rather difficult position with existing import that is not always controlled, and continued "transparency" of frontiers. The danger of bringing in quarantinable and toxic substances not found locally to any of the states in the commonwealth has grown immeasurable. There is concern about technical support. There are no computers, duplicating equipment or operational communications resources. There has also been a decline in general qualifications of specialists, particularly if we consider that the Russian quarantine service, for example, has virtually doubled in the last 2 years. Under such conditions one should rely only on active interaction between services of independent states, high technical support, complete computerization of all departments and restoration of a unified system for training qualified specialists. All this will

require considerable funds, but most inspectorates earn them by rendering paid services, and the only question is to learn to spend them wisely in the interests of the service. For example, several Russian inspectorates that perform large volumes of work have started to install fax machines to improve communications.

The experience gained in operations of the last 2 years, particularly with respect to preparation of legislative and standard-setting documents, should be reported in order to coordinate the work of national services. For example, the Turkmen State Inspectorate has approved a new Charter and statute on the quarantine service; by special order of the government, Kazakhstan has begun to furnish uniforms free of charge to all employees, legislation has been adopted, and national lists of quarantinable items have been approved in other states. All this information must be systematized, and the most interesting data should be published in ZASHCHITA RASTENIY.

Bioprotection Has Become the Norm

947C0391B Moscow ZASHCHITA RASTENIY
in Russian No 12, Dec 93 p 42

[Article by T. G. Lukyanova, chief of biolaboratory at Tver Plant Protection Center, and N. I. Veremeyev, senior agronomist for plant protection at the Kalinin AOZT, under the rubric: "Consultations, Advice, Information"]

[FBIS Translated Text] A total of 14 biological agents are used to protect agricultural crops in Tver Oblast, 11 of which in protected ground. Of all the biological agents used, eight are produced in bio-laboratories in this oblast (boverin, verticillin, ampelomycin, trichodermin, phytoseiulus, gall midge, amblyseius, encarsia).

Much attention is given to the biological method at the Kalinin Hothouse Combine, where 18 ha are planted with vegetable crops. It has a senior agronomist for plant protection. The collective farm biolaboratory, with a staff of seven, works on breeding phytoseiulus, aphidimisa gall midge, amblyseius, encarsia, and aphidius. Here, attention is focused on entomophages and acariphages. A total of 2000 m² of useful space in breeding hothouses has been reserved to raise them, 1200 m² of which is reserved for phytoseiulus, 120 m² for gall midge, and 680 m² for encarsia.

Breeding phytoseiulus starts in December. There are three people involved in this work. Thanks to preventive resettlement of the predator spider mite appears later and later each year in the hothouses: while it was found in February up to 1988, it appeared only in the last third of April in 1992. A total of 82.5 million specimens of this predator were produced in 1992.

On the average, 143 predators per square meter are released in production hothouses, with 3-5 such releases per season. Biological effectiveness is 81 percent. The

hothouse combine not only provides for its own phytoseiulus, but also furnishes other hothouse-equipped farms in the oblast.

Encarsia is used to control white flies. It is raised in a special hothouse reserved for tobacco. After being cut, tobacco leaves grow rapidly and new seedlings are not required for a year. The encarsia yield per plant is 90,000-95,000 specimens, and an average of 3000-4000 specimens is gathered from one large leaf. Encarsia puparia are separated by washing the leaves for 2 min in a washing machine with at water temperature of 19-20°C. After removing the leaves from the tub, encarsia pupae remain on the water surface due to difference in specific gravity, while the flies drop to the bottom. Nonparasitizing nymphs of the pest that form a sediment are flushed out with the water, while encarsia pupae remain on the walls of the tub and are flushed on a capron sieve and dried. The dried and fanned puparia are stored in test tubes and put in a refrigerator where they are stored at 8-10°C. One gram contains 30,000-40,000 puparia. When preparing to release the parasite, the test tubes are taken out of the refrigerator for 2-3 days, during which encarsia will hatch from parasitized larvae, while the white fly perishes. Encarsia free of white flies is used on cucumbers and tomatoes. In 1992, pesticide treatment was not carried out, the biological method was all that was used. A total of 8.5 million encarsia specimens was obtained, and the standard number released per season was 15/m². For preventive purposes, 5-6 specimens/m² were released. Biological effectiveness constituted 78-92 percent.

Amblyseius is used against tobacco thrips at the Kalinin AOZT, and boverin is used elsewhere. Amblyseius is raised in the biological laboratory. This predator is released on the plant once every 2-3 weeks at the rate of 200-300 specimens/m². A protective effect is observed for 3-4 months when amblyseius is spread together with siftings. Preventive release of the predator is started in late February.

Predatory gall midge is used to control melon and cotton aphids on cucumbers and peach aphid on tomatoes. Aphids are raised in the hothouse on legumes and wheat. Gall midges are raised in the laboratory. Gall midges are released in production hothouses starting in March. Standard release constitutes 15 specimens per m². Biological effectiveness constitutes 71-78 percent.

As before, trichodermin is used to suppress root rot. Standard usage is 2-10 kg per 1000 m². The first treatment is carried out before planting in the permanent place and the second, after plants have rooted. Thereafter, treatment is repeated as needed. Biological effectiveness of trichodermin is 81-86 percent.

The extent to which the biological method is used at the Kalinin AOZT is not diminishing, rather it is increasing annually. The share of biological treatments has risen from 41 percent of all protective measures carried out in hothouses in 1988 to 93 percent in 1992. Specialists and

workers have become convinced that they can do without pesticides. However, one can expect high and stable effectiveness of the biomethod only when farms that do not have their own biolaboratories or specialists will conclude agreements with producing laboratories, not only for delivery of agents, but also work on their use. Since it is expressly improper use of biological agents that leads most often to loss of harvests and disappointment in this progressive method.

Study of the Significance of Pesticin 1 for *Yersinia pestis* Virulence and Immunogenicity

947C0344A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 7, Jul 91 [manuscript submitted 22 May 1989; after revision 25 Oct 90] pp 8-11

[Article by N. N. Grebtsova, A. S. Chernyavskaya, S. A. Lebedeva, Scientific Research Anti plague Institute, Rostov-na-Donu; UDC 579.843.95:579.252.55].8]

[FBIS Abstract] A considerable number of determinants of the virulence and immunogenicity of the plague agent are located on three plasmids that are typical of the agent. One plasmid is the 6-megadalton pYP plasmid, which contains the structural genes for pesticin 1 (Pst) and the invasiveness enzymes that accompany it (Cgl and Fib). Although the structure of pYP has been studied widely, the roles played by the plasmid's products have not been determined. A number of researchers, however, have published on the necessity of pesticin 1 for the expression of virulence in *Y. pestis*. In earlier work, the researchers here identified a Tn-like element responsible for gentamycin resistance in the *Escherichia coli* R323 plasmid. That element was used to obtain a 6-megadalton plasmid with a pesticin 1 "switch-off" gene and and engineer Pst⁻ strains of *Y. pestis* that still have the activity of the other products of a 6-megadalton plasmid, including coagulase, fibrinolysin, protease, and the protein for immunity to pesticin. The researchers found that, with subcutaneous penetration of bacteria, pesticin 1 does not play an essential role in the expression of virulence or immunogenicity. They also found that persistent switch-off of the Pst gene does not lower the virulence of *Y. pestis* when bacteria are introduced subcutaneously in guinea pigs or albino mice, and it does not attenuate the immunogenicity for the albino mice. References 22: 15 Russian, 7 Western.

Adhesion of Pathogenic Microflora on Carbon Sorbents

947C0344B Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 7, Jul 91 [manuscript submitted 28 Aug 90] pp 11-14

[Article by A. V. Grigoryev, N. T. Kartel, V. M. Bondarenko, V. A. Znamenskiy, L. G. Kupchinskiy, M. Ye. Shor-Chudnovskiy, S. L. Medvedev, Ye. V. Sudzhin, L. N. Rachovskaya, I. M. Samodumova, Kiev Institute of Postgraduate Medicine, Scientific Research Institute of

Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow; UDC 616.98-085.246.2:661.183.2]

[Abstract] Although adsorbents capable of binding microbial cells and their toxins are enjoying increasingly wider popularity in the treatment of infectious lesions, there have been no quantitative assessments of the characteristics of charcoals in terms of the adsorption of pathogenic bacteria. Nor have there been any studies of the mechanisms of the interaction between the adsorbents and the microbes. In a study of samples of SKN and KAU carbon sorbents authorized for clinical use, the researchers here demonstrated that there is an active, nonspecific interaction between the adsorbent surface and the cell walls of pathogenic bacteria that does not destroy the microbial cells. The interaction is in two stages, the first involving so-called long-distance electrostatic forces, the second involving so-call short-distance forces. There are also bonds between the cell structures and the functional surface groups of the carbon sorbents. The geometry of the sorbent surface is important. The adsorbent KAU₀-1 demonstrated the highest degree of adhesion. Figures 3, references 9: 8 Russian, 1 Western.

Characteristics of Reactogenicity and Immunological Activity of a New Chemical, Bivalent Cholera Vaccine, From the Results of Controlled Tests

947C0344C Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 7, Jul 91 [manuscript submitted 10 Jul 90] pp 55-58

[Article by A. A. Sumarokov, N. R. Ivanov (now deceased), M. N. Dzhanapiridze, Ye. A. Rystsova, Yu. B. Reznikov, L. Ya. Matusevich, G. P. Nikitina, Yu. Yu. Yeliseyev, G. V. Adamova, M. N. Plotnikova, A. A. Popov, V. Ya. Shustov, V. V. Korolev, T. M. Drobysheva, L. G. Belov, M. V. Meleshchenko, M. N. Kovalenko, Z. V. Malykhina, T. A. Kotkina, L. M. Firsova, L. P. Pavlova, All-Union Scientific Research Anti plague Institute Mikrob, Saratov; State Scientific Research Institute for the Standardization and Control of Biomedical Preparations imeni L. A. Tarasevich, Moscow; UDC 615.371:579.843.1].036.8.07]

[FBIS Abstract] WHO recommends that cholera vaccines contain both the Inaba and the Ogawa serovars because the hypothesis of cross immunity has not been adequately proven. In earlier studies, the researchers here substantiated the possibility of enriching the commercially available single-valent vaccine (Inaba O-antigen) with the soluble somatic antigen of the Ogawa serovar. In the work reported here, the researchers compared the reactogenicity and immunological activity of the commercially available single-valent vaccine and a new bivalent vaccine enriched with the Ogawa O-antigen. They found that vaccination with the modified vaccine (cholero-gen-antitoxin + Inaba and Ogawa O-antigens) was accompanied by systemic and local reactions whose frequency and intensity corresponded to the

reactogenicity required of the commercially available single-valent cholera vaccine. The immunological activity of the new vaccine is not inferior to that of the commercial vaccine, and the new vaccine induces intense production of vibriocidal antibodies to the Inaba serovar strain. References 12: 8 Russian, 4 Western.

Use of Latex Agglutination Test for Diagnosing Brucellosis Infection

947C0344D Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 7, July 1991 [manuscript submitted 2 Aug 90] pp 61-63

[Article by I. S. Opaleychuk, N. S. Umnova, M. M. Zheludkov, I. P. Pavlova, Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow; UDC 616.98:579.841.93]-078]

[FBIS Abstract] The latex agglutination test (LAT)—a simple, inexpensive diagnostic test—offers distinct advantages over tests based on erythrocytes or bacterial cells. The latex suspension is stable for as long as five years, the composition of the test kit is uniform, and there are no receptors of varying specificity. The researchers here set out to identify the optimal conditions for preparing an antigen diagnostic kit based on domestically produced latex and determine the kit's diagnostic effectiveness against brucellosis in humans. They studied 15 latexes and concluded that the LAT, in terms of sensitivity, is more effective than other serological tests both for acute and for chronic forms of the disease. A high degree of correlation was established between the LAT, on one hand, and the agglutination test, the Coombs' test, and the passive hemagglutination test, on the other ($r = 0.83, 0.72$, and 0.62 , respectively). References 5: 3 Russian, 2 Western.

MEDICINE AND PUBLIC HEALTH

Comparative Physiological and Hygienic Assessment of the Technology Associated With the Use of Pesticides in Hothouses for Vegetable- and Flower-Growing

947C0352 Moscow *VRACHEBNOYE DELO* in Russian No 7, Jul 91 [manuscript submitted 28 Jan 92] pp 100-104

[Article by V. F. Viter; UDC 613.6+632.95:635]

[FBIS Abstract] The time factor associated with the use of pesticides in vegetable and flower hothouses was studied in its relationship to the functional status of hothouse workers. Physiological and biochemical indices such as heart rate, systolic and diastolic pressure, attention span, latent period of hearing and motor response, muscle strength and endurance, body temperature, cholinesterase activity, and vital capacity were monitored in two groups of eight or nine people each. The

researchers determined that chemical levels, as well as duration of contact with xenobiotics, should also be considered in such assessments. Psychophysiological response, heat regulation, and status of the cardiovascular system and other systems should also be studied. References 3 (Russian).

Health Status of Populace After Accident at Chernobyl Nuclear Power Plant (Based on Data for the Kiev Oblast)

947C0351A Moscow *VRACHEBNOYE DELO* in Russian No 7, July 1991 [manuscript submitted 30 Sep 92] pp 6-10

[Article by A. I. Avramenko, T. P. Sivachenko; UDC 614.876+612.014.481]

[Abstract] The health status of the populace in Kiev Oblast—especially that of children—grew considerably worse after the accident at Chernobyl. Chronic nonspecific diseases are on the rise. Thyroid problems—especially thyroid cancer among children—have increased in number. Determination of the dose rate on the thyroid gland represents one the main problems associated with the cleanup of the accident. Calculation of the dose should take into consideration not only ^{131}I , but also short-lived radionuclides of iodine, as well as radionuclides of other elements that enter the body via inhalation and ingestion. Morbidity analysis should allow for the condition of other of the body's organs and systems in whose activity the thyroid gland plays a leading role.

Ionizing Radiation and the Kinin System of the Blood

947C0351B Moscow *VRACHEBNOYE DELO* in Russian No 7, Jul 91 [manuscript submitted 28 Oct 1992] pp 11-14

[Article by T. F. Lyubarets, Ukrainian Science Center for Radiation Medicine, Ukrainian Ministry of Health and Academy of Sciences of Ukraine; UDC 577.156.6.612.014.481/482]

[FBIS Abstract] The kinin system is a proteolytic system that helps to maintain homeostasis. Among the factors that activate the kinin system is ionizing radiation. The fact that the activation of proteolysis is the earliest sign of a disruption of the metabolism in a body that has been irradiated suggests the participation of kinins in the pathogenesis of radiation injury. This survey of the literature points out that studies of the kinin system have been performed mainly on animals in experiment. But observational data is lacking with regard to the kinin system in the post-irradiation period. Most researchers have focused on only certain of the aspects of that system. There are only a handful of studies of the condition of the kinin system in individuals exposed to ionizing radiation as a result of the Chernobyl accident. References 25: 20 Russian, 5 Western.

Microbiologic Characteristics of a Purulent Wound While Under Laser Irradiation

947C0385A Moscow KHIRURGIYA in Russian Vol 11
No 3, May-Jun 94 (manuscript received 11 Nov 91)
pp 32-35

[Article by R.S. Cherkasskaya, candidate of medical sciences, S.M. Nesterova, candidate of biological sciences, A.I. Efendiyev, candidate of medical sciences, and A.I. Tseytina, Central Epidemiology Scientific Research Institute, Moscow]

[FBIS Abstract] A study compared the effectiveness of infrared laser and conventional (i.e., antibiotics, antiseptics, and salves) treatment of soft tissue lesions. Seventy-six surgical patients with purulent soft tissue lesions were subjected to bacteriologic examinations. Microbiologic analyses of the patient's wounds were performed immediately after the purulent focus had been uncovered and again on days 3, 6, and 9 of the postoperative period. Samples of the infected tissue (each weighing 1 g) were excised, placed into sterile containers, and held in a laboratory for 2 hours. The tissue samples were then weighed and examined for the presence of bacteria. The patients were randomized into eight groups. Three of the groups were included in the study. After the initial surgical procedure, the lesions of the members of the first group were subjected to local treatment with an Uzor pulsed infrared laser (modulation frequency, 80 Hz; exposure, 284 s for 3-5 sessions). A Skalyar continuous-wave infrared laser (wavelength, 890 nm; power output at the end of the lightguide, 20 mW [i.e., 1.2 J/cm²]) was used for local treatment of the lesions of the members of group 2. Conventional methods (antibiotics, antiseptics, and salve) were used to treat the lesions of the members of group 3. At the time of the initial surgical intervention, all of the lesions were found to contain some type of bacteria. In all, 85 strains of bacteria belonging to the following species were detected: *Staphylococcus aureus*, *S. xylosus*, *Staphylococcus epidermidis*, *Staphylococcus hominis*, *Staphylococcus simulans*, *Escherichia coli*, *Klebsiella oxytoca*, *Enterobacter cloacae*, *Proteus vulgaris*, and *Proteus mirabilis*. *S. aureus* was detected alone in 75.2 percent of the patients and was found to be present in associations with other bacteria in an additional 12.3 percent of patients. After the surgical procedure combined with laser or conventional treatment, the lesions of 84.6 percent of the patients in group 1, 60.0 percent of the patients in group 2, and 45.4 percent of the patients in group 3 still contained *S. aureus*. On day 3 after the procedure, *S. aureus* was found in the lesions of 53.8 percent of the patients in group 1, 37.5 percent of the patients in group 2, and 54.5 patients in group 3. On day 5, *S. aureus* was discovered in the lesions of 7.6 percent of the patients in group 1, 0 percent of the patients in group 2, and 63.0 percent of the patients in group 3. On day five, *S. aureus* was found in 23.1 percent of the patients in group 1, 0 percent of the patients in group 2, and 36.3 percent of the patients in group 3. On day 9, the average numbers of colony-forming units found in the

patients' lesions were as follows: group 1, 1.3×10^5 ; group 2, 0; and group 3, 2.2×10^6 . The various treatment regimens were thus concluded to afford the following degrees of elimination of pathogenic microflora (as represented by *S. aureus*): Uzor pulsed laser, 99.7 percent; Skalyar continuous-wave laser, 100 percent; and conventional treatment, 96.8 percent. Table 1; references 7: 5 Russian, 2 Western.

Head Health Care Institution

947C0432A Almaty ZDRAVOOKHRANENIYE
KAZAKHISTANA in Russian No 12, Dec 93 (signed to
press 28 Nov 93) pp 4-7

[Article by B. Ye. Dzhugashev, Almaty Oblast Clinical Hospital; UDC 614.211(574.20)]

[FBIS Translated Text] The population of Almaty Oblast, numbering almost one million people, is serviced by 19 oblast medical and preventive care institutions, 11 central rayon, 5 rayon, and 63 rural district hospitals, 87 SVA [rural obstetric centers] and 278 FAP [feldsher-midwife centers], employing 2590 physicians and 9110 mid-level health care providers. Availability per 10,000 population constitutes 26.6 physicians and 93.6 feldshers, the republic indicators being 36.8 and 107.9, respectively.

In the last 3 years, 843 physicians and 1684 mid-level medical workers have advanced their qualifications, while 262 physicians and 446 mid-level medical workers underwent specialization and advanced training last year alone.

The Almaty Oblast Clinical Hospital is the head institution in the oblast in the matter of health care, and it is the center for organizing medical and preventive care. It was opened in 1952, at the suburban district hospital, with 60 beds and 2 departments, medical and surgical. Today, it is a large multispecialty 605-bed hospital with 11 departments, consultative polyclinic, strong diagnostic service, and facilities for boarding patients from distant regions.

The organizational-methodological section comprises departments of emergency and scheduled consultations, statistics department with ASU [automated control system], NOT [efficiency experts] and scientific-methodological information groups, and ongoing courses for advanced training of mid-level medical personnel.

Attention is focused mainly on training the primary element, the staffs of FAP and SVA. Classes are offered in 11 cycles for obstetricians, feldshers, ward, treatment and surgical nurses, department head nurses, physiotherapy nurses, x-ray technicians, clinical and biochemical laboratory technicians, specialists in autoclaves, and medical statisticians. We offer routine consultations, prepare methodological aids for rural health care, and offer advanced training for employees of the oblast's

LPU [medical and preventive care institutions]. Scheduled trips are made by health care management personnel and administrators of the oblast clinical hospital, along with a team of specialists, to different regions for the purpose of rendering practical assistance and comprehensive investigation of the local situation, with involvement of heads of farms and employees of rayon administrations.

The range of issues discussed on the basis of each such trip is extensive, from strengthening the material base of some FAP to establishment of a new service at a rayon hospital.

There are continuous studies of morbidity of the population and other indicators, specifics of frequency of seeking medical care by the rural population, and occupation with consideration of the specifics of agricultural work.

Each year, teams of specialists of our hospital make 28-30 trips to different rayons of the oblast, mainly to transhumance regions in the summer and wintering period.

Considering the fact that the material and technical base does not permit opening new departments, we earmarked some specialized beds. For example, the surgical department now has thoracic and vascular surgery wards. Thoracic surgeon S. M. Shakirov and vascular surgeon Ye. K. Kenzhebekov are now performing operations there. Last year alone, they performed 87 specialized major operations, and we now refer fewer patients to the Institute of Surgery and other institutions.

The staff of the anesthesiology and resuscitation department is performing well; it has a resuscitation section (12 beds), 24-hour anesthesiology group, mobile resuscitation team (24-h duty), groups for hyperbaric oxygenation [HBO], gravity surgery, as well as acute and chronic hemodialysis (8 beds) on a 2-shift schedule, which have the use of 12 hospital beds in the surgical department.

In 1992, 1295 patients, which is 11.3 percent of the total number of admissions, were admitted to the anesthesiology-resuscitation department. For the last 3 years, the mortality rate was 7.5-7.7 percent (about 100 people).

In 1992 alone, the following procedures were used extensively in the department: hemodialysis with ultrafiltration and a single-needle perfusion unit (BP machine); plasmapheresis with washed erythrocytes, Isolde ultraviolet unit, laser treatment of blood with Aloka-1 unit, drainage of lymph from thoracic lymph duct, arteriovenous shunts, epidural anesthesia for parturition, HBO using the BLK machine and Mana pressure chamber for neonates, transportation of patients on artificial respiration (Parapak machine) by medical aircraft and rescue ambulances, and others.

Special mention must be made of the work of the department of rehabilitation therapy, which is outfitted with all necessary equipment and apparatus. In 1992

alone, it adopted laser therapy using acupuncture points, heliotherapy, ultraphonophoresis, and mud baths for osteochondrosis. Urological ultrasound, vacuum massaging unit, the Laser-FLOX machine, Vulcan-1, UZT and UP-01-M inhalers are used. Functional humohalotherapy—treatment of chronic diseases of the bronchopulmonary system by inhalation of highly disperse sodium chloride aerosol—has been instituted.

Since 1989, the team [brigade] method of organizing payment of wages has been adopted. At the present time, there are 29 teams for all services. A commission was formed to assess their performance; the index of contribution of each team member is used; criteria have been elaborated, the main ones being qualitative and quantitative departmental indicators, sanitary and disinfection program, and work discipline. Thanks to adoption of this form of organizing labor, virtually all indicators of hospital performance have improved, sanitary condition is better, in spite of the fact that most departments are understaffed, particularly with respect to mid- and junior-level personnel. Material incentives played a positive role, and wages have increased by an average of 45 percent at this hospital.

Much is being done to computerize and automate hospital operation. The ASU office was opened in 1990, and it is among the first in the republic. Its main task is to develop and introduce software for the oblast's medical and preventive care institutions. At the present time, it runs the Medstat, Medinform, Hospital ASU and Food-Handling ASU programs. Credited wages and absentee reports are now automated. ASU will also play a part in the forthcoming transition to insured health care and establishment of an automation network in medical and preventive care institutions of the oblast. We have developed the method of calculating expenses per patient, with consideration of degree of complexity of treatment.

Staff units for a scientific-methodological information (NMI) group have been assigned to the organizational and methodological department of the OKB [special design office], which serves as the coordinating center for this service. The group gathers, analyzes, summarizes and reports scientific medical information for administrators and specialists in the oblast, thus shortening the time for adoption of scientific achievements and progressive knowhow in the practice of scientific [efficient] organization of labor. It makes use of forms of work such as conferences of physicians and nurses, "specialist days," and "information days" at the medical research library. At one such meetings, the deputy chief physician for MON [methodological-organizational science?] shared impressions of a trip to the United States and health insurance, and the head of the pulmonology department reported on her participation in the "Week of French Respiratory Medicine" in Moscow. A survey on insured health care and family medicine was offered.

The Altay method of standards for scope of medical care that is provided in stages, from FAP, SUB [expansion

unknown, could be North-Ural hospital) and TsRB [central rayon hospital] to the oblast health hospital, as well as a system of working with an ATP [automation of technology planning] complex have gained wide use. As a result of adoption of these methods, there was improvement of main indicators of performance of the medical and preventive care institutions in the oblast: infant mortality dropped from 27.0/1000 in 1990 to 23.9 in 1992, and maternal deaths from 123.2 to 86.5/1000, respectively.

The oblast clinical hospital is the final stage for rendering highly skilled and specialized medical care to the public. Experience has shown that a work load of 20 patients per physician, as is the case in urban hospitals, diminishes the quality of performance of medical workers. Under our conditions, it should be reduced to 10-12 patients, since the most seriously ill people from all parts of the oblast are admitted in our hospital. Moreover, we provide emergency consultations, using surface and air transport.

The hospital serves as the base for four departments of Almaty Medical Institute and, since 1970, of the department of general surgery in the pediatric section of Almaty State Medical Institute headed by Prof. K. D. Durmanov, which provides not only scientific, but also practical assistance. Expressly this department was the initiator of adoption of methods such as diagnosis and treatment of surgical diseases, laparocentesis, bronchoscopy and bronchial lavage, peritoneal dialysis, insertion of Shalkov probe, intubation of the intestine, etc. The departments of pharmacotherapy and immunology, obstetrics and gynecology also offer much help in patient consultations and treatment. Extracorporeal methods of detoxification are used to their full extent in the clinic, including GBO, hemodialysis, hemadsorption, plasmapheresis, ultraviolet radiation and laser therapy.

Since we consider the obstetric service to be important, we have assigned additional staff entities, i.e., obstetrician-gynecologists and anesthesiologists, to render around the clock emergency care to pregnant women, those in labor and puerpera. This team is provided with a special vehicle, a rescue ambulance. These and other steps have lowered maternal mortality rate in the oblast.

In view of the acute shortage of budgeted allocations, we have begun to render paid medical services, and we offer highly qualified medical care at a minimal fee. In order to augment the hospital cash funds, we have begun to conclude contracts with some farms and enterprises in the oblast and urban regions.

One of the most important sections of the oblast clinical hospital is the consultative polyclinic, called upon to provide consultations and diagnostic services to the adult population referred by rayon medical and preventive care institutions. Its tasks include: rendering qualified medical care in the basic and narrow specialties; carrying out the necessary diagnostic laboratory-instrument and apparatus tests with use of modern

examination methods; offering recommendations for subsequent patient care under outpatient-polyclinic conditions and in hospitals.

Accordingly, the polyclinic organizes the following:—patient consultations with highly qualified medical specialists in: cardiology, gastroenterology, pulmonology, endocrinology, hematology, urology, neurosurgery, traumatology, allergology, surdology, stomatology;—tests that are not performed at rayon polyclinics, which are needed to pinpoint diagnoses, including laboratory tests (biochemical, serological, immunological, cytological, and others) and those requiring equipment (functional diagnostic, roentgenological, endoscopic);—issuance of medical conclusions with indication of diagnosis established at the polyclinic, recommendations for further patient treatment and observation. These conclusions are sent by the polyclinic to a medical and preventive care institution following established procedure, or else hands it to the latter;—help for patients referred by a rayon polyclinic in obtaining consultations with highly qualified specialists at the multispecialty hospital, as well as chief specialists in health care management and staff of research institutes.

The consultative polyclinic was organized in 1952. At that time, six specialties were covered, versus 18 at present. Its work schedule is based on availability and timeliness of providing consultations to the public. The specialists' office hours are reported at the beginning of the year to all rayon medical and preventive care institutions. The latter are informed monthly of any changes or additions to the schedule. In the last 3 years, we have been able to outfit this department with the latest medical equipment: 4-channel electrocardiograph, spirometer, electroencephalograph, ultrasound unit, endoscope, colonoscope, and others. There has been noticeable improvement of outpatient-polyclinic care of the rural population. Each year, 16,000 to 18,000 people are consulted here, 80 percent of whom are rural residents.

It should be noted that the consultative polyclinic not only implements organizational-methodological supervision of polyclinics in different rayons, but also has a positive influence on the quality of their performance. The deputy chief physician for polyclinic affairs analyzes its performance on a quarterly basis, and this serves as the foundation for making warranted management decisions, and is instrumental in implementation of outlined plans and measures.

There is strict monitoring of time of patient examination at the consultative polyclinic, and up to 90 percent of the people who come there obtain consultations within 3 days. In order to expedite examinations, studies are made of the itinerary of patient flow, time spent waiting to be seen and on the examination proper, as well as relationship between time and scope, level and quality of examination in different rayons of the oblast. Regular monitoring helps increase the volume of tests and shorten the diagnostic period at the prehospital stage.

Thus, 92.6 percent of the tests were involved per 100 visits in 1989, and 102 percent in 1992 mainly due to increase in number of biochemical and cytological tests. There has also been an increase in number of roentgenological examinations of the gastrointestinal tract, with a four-fold increase in cholecystography. A "card of flaws in patient referral to oblast polyclinic" has been adopted. Its beneficial factor is that there is a tear-off feedback stub that is mailed to rayon chief physicians, and this provides for continuity of stage-by-stage treatment.

The performance of each polyclinic physician is examined by means of expert evaluation in order to monitor the quality of the medical and preventive care process. Results are discussed at meetings, while more serious issues are discussed by the hospital board. Justification and timeliness of hospitalization are studied. All this has a beneficial effect on quality of diagnostics: while diagnostic discrepancies constituted 2.9 percent in 1989, in 1992 the figure was 1 percent.

Special attention is given to advanced training of physicians at the consultative polyclinic. They travel extensively to congresses, scientific conferences and research centers. Scientific and practical conferences of physicians and pathologists serve the same end.

Thus, we view the increase in the role of the consultative polyclinic in diagnostic diseases at their early stages and the decline of morbidity rate as further improvement of polyclinic care of the rural population.

Current Problems in Using Computer Systems To Estimate Chemicals' Toxicologic and Ecologic Hazard

947C0403A Moscow GIGIYENA I SANITARIYA
in Russian No 5, May 94 (manuscript received
28 Mar 94) pp 4-8

[Article by S.M. Novikov, V.V. Poroykov, and L.N. Semenov, MMA (expansion not given) imeni I.M. Sechenov and All-Russian Scientific Center for the Safety of Biologically Active Substances, Russian Federation Minister of Health, Russian Academy of Medical Sciences, Staraya Kupavna; UDC 615.47:681.31]. 03:614.7-07]

[FBIS Abstract] In recent years, the problem of preventing the adverse effects of chemicals and pharmaceuticals on man and the environment has received increased attention from the biomedical community and public at large. In the United States alone, more than \$20 billion is spent annually in studying the biological effect and toxicity of drugs and pesticides. Between 1979 and 1990, the number of chemicals examined and registered by the U.S. Environmental Protection Agency increased from 65,000 to 83,000; however, only 2.4 percent of widely used chemicals have been studied from the standpoint of their possible effect on reproductive function and fetal development. Furthermore, more than 79 percent of chemicals registered in the United States have

not had their toxicologic characteristics listed, and only 5 percent of all preproduction announcements contain all the information needed to evaluate their toxicity. Special computer data banks and national, departmental, and international registers (many of which have been linked together in computer networks with teleaccess) are being developed to intensify and optimize scientific research and boost the efficiency of monitoring agencies. Initially, the main use of computer technology in toxicology was in information storage and retrieval. More recently, however, it has become a powerful means of obtaining new knowledge and estimates. Numerous studies have established close correlations between toxicity parameters and maximum permissible concentrations (MPC) with lipophilic, quantum chemical, steric, topologic, and other characteristics of the structure of matter. The reliability of predictions based on such methods is generally as good as or better than that of analogous estimates based on toxicometry parameters. Despite this fact, the new methods are not yet being widely used in practice. The main reason for this is that their development and use require information that is not accessible to the ordinary user, training, and researcher intuition. Furthermore, even when research to determine quantitative structure-activity relationships [QSAR] is being undertaken, use of the resultant models within the framework of existing technologies is problematic because of the avalanche of computational formulas, complexity of finding or computing physicochemical constants, and possible errors in selecting suitable mathematical models. The most promising approach is therefore to introduce modern prediction systems of varying complexity that are geared either solely toward predicting specifically sought indicators (by using QSAR data banks) or toward deriving new QSAR. Much simpler for practical use are methods of predicting toxicity and MPC based on preliminary differentiation of chemicals based on certain features. This was precisely the direction taken in the initial development of toxicology research in Russia. The main focus was on finding general laws linking chemicals' toxicity and MPC with the most readily available physicochemical constants (molecular weight, boiling point, etc.). It soon became apparent, however, that such an approach did not yield sufficient precision in predicting toxicity parameters. Modern computer-based research methods permitting the analysis of large numbers of variables characterizing chemicals' structures and physicochemical properties were therefore introduced. Methods such as substructural analysis, multifactorial analysis, and pattern recognition are now being used in pharmacology and in designing new drugs and developing new pesticides. The main problem in using computer-based prediction methods in public health, toxicology, and ecology remains the development of methods of calculating QSAR and individual toxicity parameters. A new and still unnamed science devoted to studying the chemical-life interaction on different levels of the organization of living matter (enzyme, organelle, cell) has developed. Researchers in various countries (including the

United States and Hungary) have developed computer systems for use in studying the mechanisms of the effect and transformation of chemicals in the body and in the environment, the metabolism of various chemicals, and permissible levels of individual chemicals. In both Russia and abroad, research in creating computer systems intended to generate new QSAR and perform both applied and scientific research is continuing. Several software systems for use in this area (e.g., CHES and ADAPT) have been developed. References 55: 20 Russian, 35 Western.

Combined Impact of Biological and Chemical Factors on Morbidity and Overall Resistance of Children Living in a Rayon Containing Microbial Synthesis and Chemical Industry Enterprises

947C0403B Moscow GIGIYENA I SANITARIYA
in Russian No 5, May 94 (manuscript received
28 Mar 1994) pp 10-13

[Article by V.I. Nemyrya, Yu.N. Nikitina, G.P. Spazhakina, and N.V. Stomakhina, Human Ecology and Environmental Health Scientific Research Institute imeni A.N. Sysin, Russian Academy of Medical Sciences, Moscow; UDC 616-053.2-02:614.718]-07]

[FBIS Abstract] A 3-year study examined the combined impact of biological and chemical factors on the health status of a group of approximately 250 children living in a city containing an active biochemical plant involved in the production of feed lysine (6,400 tonnes/y) and premises based on the lysine production waste (>100,000 tonnes/y) and a chemical plant producing powder detergents, alcohols, and acids. Air sample studies established that at a distance of 400 to 2,600 m from the plants, the concentrations of the most prevalent chemicals in the city's atmosphere (nitrogen dioxide and dust) were 2-3 times higher than established maximum permissible concentration [MPC]. At distances of 400 to 10,000 m from the biochemical plant, the concentration of lysine and producer microorganisms in the atmosphere was within public health norms. The total concentration of brevibacteria within the confines of the plant's exclusion zone was within background limits; however, the concentration of total protein at all observation points (including the point 10,000 m from the biochemical plant) in 70-100 percent of the samples was 11-25 times higher than the MPC. Samples of the children's saliva were studied to estimate their resistance with respect to 6 immunologic, 2 biochemical, and 46 microbiologic indicators. In addition, the children were questioned about possible allergies and subjected to allergic screening examinations. Morbidity among those children born after the biochemical plant had begun operation was 1.4 times higher than that among children born before the plant opened. Overall morbidity among those children living in direct proximity to the plant was especially elevated. Morbidity due to allergic disease was 2.3 times higher among children born after start-up of the biochemical plant. The greatest number (93.5 percent) of children discovered to have impaired immunity

were children attending the biochemical plant's kindergarten. The chemical plant's two kindergartens were found to have the highest number of children who were either weak or frequently ill. The kindergarten with the healthiest children was the one located just 400 m from the biochemical plant but in a pine forest. At the said kindergarten, 85.7 percent of all children were classified as clinically healthy, and only 14.3 percent suffered from frequent acute viral respiratory infections. Studies of the children's saliva confirmed the adverse impact of exposure to chemicals from the area's biochemical and chemical plants on the children's immune systems. Even among the apparently healthy children attending kindergarten in the pine forest, indications of impaired immunity were found in 35 percent. The chemical plant's kindergartens were found to have the highest percentages of students with reduced resistance to disease. The correlation found between the screening examinations and laboratory tests led researchers to conclude that the city's chemical and biochemical plants are definitely sources of atmospheric pollution that is in turn linked to elevated general and allergic morbidity among the city's schoolchildren. Figure 1, table 1; references 6 (Russian).

Sanitary-Virologic Assessment of the Effectiveness of Using Zeolite To Eliminate Enterovirus From Water

947C0403C Moscow GIGIYENA I SANITARIYA
in Russian No 5, May 94 (manuscript received
28 Mar 94) pp 17-19

[Article by A.Ye. Nedachin, T.V. Doskina, R.A. Dmitriyeva, E.A. Sukhareva, and V.S. Sheverev, Human Ecology and Environmental Health Scientific Research Institute imeni A.N. Sysin, Russian Academy of Medical Sciences, Moscow; UDC 614.777:579.842.1/.2]-078]

[FBIS Abstract] A series of experiments were conducted to determine the effectiveness of using zeolites in filtration of drinking water. On the day of the experiments, a suspension of enterovirus in a final concentration of 2.47 to 2.55 lg TCID₅₀ was added to dechlorinated tap water. Zeolites were loaded into 17-mm-diameter sterile columns to a height of 12 to 50 cm. The water was poured into the columns through a system of hoses. The water's pH and flow rate were varied from one run of the experiment to the next. Samples of water that had been passed through the zeolites were then analyzed by the generally accepted methods, and the concentration of virus remaining in the water samples was measured by titration. The effectiveness of fine (particle size, 0.32 to 0.62 mm) and coarse (particle size, 0.63 to 1.25 mm) zeolites was compared. The finely dispersed zeolite fraction (particle size, 0.32 to 0.62 mm) proved highly effective in absorbing the enterovirus regardless of the starting concentration of the virus, the pH of the water, the filtration rate, or the height to which the column was loaded with zeolite. The effectiveness with which the coarsely dispersed zeolite trapped the enterovirus, on the other hand, depended on filtration rate and height to

which the column was loaded. The lowest effectiveness (4.9 to 7.8 percent) was observed at a high filtration rate (8 m/h) at virtually all zeolite column heights (12 to 50 cm). Zeolite effectiveness increased to 8.2-23.9 percent as the filtration speed was reduced to 4 m/h. The highest absorption efficiencies (11.5 to 35.4 percent) were observed at a filtration rate of 1 m/h. Optimal absorption efficiency of the coarsely dispersed fraction (35.4 percent) was reached when the column was loaded with zeolite to a height of 50 cm and filtration proceeded at a rate of 1 m/h. Tables 3; references 8 (Russian).

Determining Rate Constants of Xenobiotic and Xenoreceptor Interaction From Toxicology Data

947C0403D Moscow GIGIYENA I SANITARIYA
in Russian No 5, May 94 (manuscript received
28 Mar 94) pp 52-53

[Article by V.N. Pavlov, Human Ecology and Environmental Health Scientific Research Institute imeni A.N. Sysin, Russian Academy of Medical Sciences, Moscow; UDC 615.471.03:[615.2/.3.07]:614.71/.73]-07]

[FBIS Abstract] A mathematical apparatus has been developed to describe the interaction of toxic chemical environmental pollutants and the mammalian body. The method is based on equations of the dependence concentration (dose)-time-effect that make it possible to calculate the magnitude of effect, median lethal dose (LD_{50}), or kinetic constants that are may turn be used to calculate the effect mechanism. In the simplest case, the dose-time-effect dependence (with no consideration for metabolism) is described by the equation $\ln(1 - E/a) = kD/b$, where D is the adjusted dose (in mol/l), which is in turn tied to table dose values D' (in mg/kg) through molecular weight and density (in kg/l) (which is tentatively assumed to equal 1). The said rate constant may be roughly estimated from toxicokinetics data because it varies less than other constants do and remains within narrow bounds within the confines of a single homologous series or in a series of rather similarly structured substances. The median lethal doses of 15 chemicals and the rate constants of their interaction with mice, rats, or rabbits were calculated. The said rate constants generally ranged from several thousandths to several tenths (l/(mol·s)). Of the 15 chemicals for which calculations were performed, fluoroacetic acid had the highest rate constant by far and thus merits further attention from the standpoint of the mechanism of the interactions of xenobiotics and the body's sensitive biological structures. Table 1; references 7: 6 Russian, 1 Western.

Polymer Biosoluble Drug Films—An Effective Form of Drug Use in Cases of Systemic and Local Therapy

947C0363C Moscow MEDITSINSKAYA TEKHNKA
in Russian No 2, Mar-Apr 94 (manuscript received
1 Sep 1993) pp 23-26

[Article by G.L. Kromov, All-Russian Medical Technology Scientific Research and Testing Institute, Russian Federation Ministry of Health, Moscow; UDC 615.462.03.07]

[FBIS Abstract] A new biosoluble copolymer whose macromolecule contains fragments of acrylamide, vinylpyrrolidone, and ethylacrylate has been used as the basis of biosoluble drug films that containing drugs administered in various areas of medicine. In ophthalmology, the new biosoluble copolymer drug film has proved to be superior to the aqueous solutions and salves that have until now been used as a medium for administering eye drugs in that it 1) permits programmed entry of drugs into the body by regulation of the macromolecular structure and chemical nature of the polymer matrix, 2) makes it possible to use a single type of manufacturing equipment to create ready-to-use medications containing different drugs, and 3) permits exact dosing of drugs. Ocular drug films with average weights of 15.1 to 15.9 mg have, for example, been produced to deliver 1.6 mg of atropine, 0.75 mg of tetracaine hydrochloride, 1.10 mg of kanamycin, 2.60 mg of pilocarpine, and 5.25 mg of sodium sulfamethoxypyridazine. In cardiology, drug films are being used successfully to administer trinitrolong. In stomatology, biosoluble polymer films are being used as a way of administering drugs such as sodium sulfamethoxypyridazine, kanamycin, and dexamethasone in the treatment of inflammatory infections of the mucous membrane of the oral cavity. Biosoluble polymer drug films have also come to be used in the prevention and treatment of various postoperative wound complications, treatment of trophic ulcers, and prevention of hematoma formation. Finally, biosoluble polymer films are being used as a vehicle for administering substances such as anabesine and cytosine in antinicotine therapy. Tables 2.

BOP-Type Polymer Implants for Fixation of Tubular Bones and Replacement of Osseous Tissue Defects

947C0363A Moscow MEDITSINSKAYA TEKHNKA
in Russian No 2, Mar-Apr 94 (manuscript received
1 Sep 1993) pp 9-11

[Article by S.I. Belykh, All-Russian Medical Technology Scientific Research and Testing Institute, Russian Federation Ministry of Health, Moscow; UDC 616.472.03:616.717/.718-089.22]

[FBIS Abstract] In addition to metal pins, the following four types of biocompatible polymer pins are currently used in traumatology and orthopedics for fixation of tubular bone fractures: 1) ShP polymer pins, which are manufactured in 10 type sizes (with diameters ranging from 5 to 14 mm and lengths ranging from 300 to 450 mm) from a copolymer of N-vinylpyrrolidone and methylmethacrylate; 2) ShPA biocompatible antimicrobial polymer pins, which gradually release dioxidine directly into the bone marrow channel and thereby provides an anti-microbial effect for 2-3 weeks in a total dioxidine dose not exceeding 300 mg; 3) ShPR biocompatible x-ray contrast polymer pins; and 4) ShPG high-strength hybrid polymer pins. ShP, ShPA, and ShPR pins have been used in more than 800 operations and have been demonstrated to provide reliable fixation of all tubular bones

with the exception of the hip bone. Thanks to the pins' ability to desolve, no further operations are required for their extraction. The ShPG hybrid polymer pins are 30-40 percent stronger than ShP pins (they have a flexural strength of 23-25 MPa) and have an elasticity modulus that is 3 to 5 times higher than that of the ShP pins. Extensive clinical trials of the ShPG pins have confirmed their suitability for use in medical practice; however, they are still not yet strong enough for reliable fixation of hip fractures in cases where conventional osteosynthesis methods are used. The material used to manufacture ShP pins has also been used as the basis for developing type PPV polymer material to fill osseous cavities. The material is in the form of flexible rods/splints that are 3-4 mm thick and 100-400 mm long and are manufactured from modified kapron fiber coated with a mixture of PPM-1 copolymer and calcium gluconate. The splints resolve after 9-15 months and are replaced by natural osseous tissue. They have been used successfully to fix hip endoprostheses. The rods/splints are similar to those produced under the trademark BOP-F by Diversified in Belgium and under license in the Russian Federation. The rods/splints have also been used with good results in treating Perthes' disease. Another new development is the new material PR, which is based on a copolymer PPM-1 (N-vinylpyrrolidone plus methylmethacrylate) and intended for filling osseous skull defects. The material is manufactured in the form of a kit consisting of 5 g powder PPM-1 copolymer and 10 ml of a 20 percent solution of the said copolymer and 80 percent ethyl alcohol. The new kit has been used successfully in more than 150 operations in the Russian Federation, and more than 300 successful operations have been performed with an analogous kit produced in Russia under license from Diversified. All of the aforementioned new products are being series-produced in sterile form and individual packaging. References 9: 8 Russian, 1 Western.

Disposable Polymer Products for Artificial Blood Clearance

947C0363B Moscow MEDITSINSKAYA TEKHNIKA
in Russian No 2, Mar-Apr 94 (manuscript received
10 Nov 1993) pp 14-18

[Article by A.I. Khaytlin, All-Russian Medical Instrument Making Scientific Research Institute, Russian Academy of Medical Sciences, Moscow; UDC 615.462.03:615.38.012.8]

[FBIS Abstract] Artificial blood clearance makes it possible to regulate the blood's ion composition and remove toxic products and excess water from it. In modern medicine, artificial blood clearance has come to enjoy wide-scale use thanks to its proven clinical results, safety, and availability. Numerous foreign firms are now manufacturing various disposable polymer products for use in extracorporeal artificial blood clearance. These disposable products are superior to similar products intended for repeated use in that they make it possible to

improve the clinical indicators and safety of extracorporeal life support. The availability of such disposable products in Russia still remains limited, however. This is mainly because of the continually increasing costs of purchasing disposable items. One way of solving this problem besides improving the actuators and communicating lines involved in extracorporeal blood clearance is to simplify the design of the lines used in the procedure while enabling them to perform the functions required in the many existing artificial clearance methods. In view of this fact, an universal line kit has been proposed that includes two roller segments (RS1.1 and RS2.2), one infusion line (IL1), two separation chambers (RK1.2 and RK2), two air traps (LV1 and LV2), and three injection units (IU1, IU2.1, and IU2.2). These individual kit components may be used in various combinations as incoming and outgoing lines for different perfusion modes (e.g., one- and two-pump perfusion with one or two communicating elements and provisions to control pressure difference). The developers of the new universal line kit for artificial blood clearance are the All-Russian Instrument Making Scientific Research Institute in Moscow and the Belgorod-Dnestr Polymer Medical Products Plant in Ukraine. Figures 4, tables 2; references 3 (Russian).

Peptide-Containing Biosoluble Polymer Films. Preliminary Results of Using Thyrotropin-Releasing Hormone-Containing Films in Narcology and Psychiatry

947C0363D Moscow MEDITSINSKAYA TEKHNIKA
in Russian No 2, Mar-Apr 94 (manuscript received
1 Sep 1993) pp 26-29

[Article by V.M. Bulayev, A.A. Glazov, and I.M. Milopolskaya, Narcology State Scientific Center, Russian Federation Ministry of Health, Moscow; UDC 615.462.03:616.89-08]

[FBIS Abstract] Data contained in the literature and original data collected by the authors in their own research were reviewed in an assessment of the prospects of using thyrotropin-releasing hormone [TRH]-containing biosoluble polymer films in the treatment of alcoholism, drug addiction, and depression. The use of biosoluble polymer films as a medium for administering TRH was said to be promising in that it eliminates one of the main drawbacks of peptide preparations, namely, the fact that they are destroyed by the enzymes present in the gastrointestinal tract. A new TRH-containing biosoluble polymer film called thyropol and tests conducted to determine its efficacy were described. Thyropol was shown to have favorable effects on the psychopathological symptoms of alcohol abstinence. Within 3 days after the initiation of thyropol administration, alcoholism patients' nausea and stomach pain disappeared and their appetites reappeared. In half the patients, symptoms of general hyperhydrosis disappeared after 1 day, and in the remaining patients it was reduced during the next 2 days. Thyropol proved ineffective in treating a number of

patients with symptoms of anxiety and simple cyclothymic subdepressions. Like anti-depressants, tranquilizers, and other drugs with a vegetative, somatic, and neurological effect, thyropol did not terminate abstinence syndrome, but only arrested alcohol abstinence symptoms. Although thyropol was shown to be rather effective for the first 4 days of administration, it failed to have a long-term effect on the symptoms of alcohol abstinence. A study of thyropol's efficacy with 64 patients suffering from depression of various genesis was also reported. The thyropol films were demonstrated to have pronounced therapeutic efficacy in cases of neurotic depressions (especially those of reactive genesis). Furthermore, the thyropol films had a distinct activating effect and resulted in a quick therapeutic effect even in a number of patients who had previously been found to be resistant to conventional therapy methods. The thyropol films arrested acute and subacute states of depression and improved polymers' psychophysiological tonus and social adaptation. The films were especially effective in six patients suffering from premenstrual syndrome. In addition, the thyropol films had no serious side effects and were deemed convenient for self-administration in outpatient settings.

Kapromed—An Antibacterial Suture Material

947C0363E Moscow MEDITSINSKAYA TEKHNIKA
in Russian No 2, Mar-Apr 94 (manuscript received
1 Sep 1993) pp 32-34

[Article by A.V. Volenko, Ch.S. Germanovich, O.P. Gurova, and R.A. Shvets, Moscow Emergency Care Scientific Research Institute imeni N.V. Sklifosovskiy and All-Russian Medical Technology Scientific Research and Testing Institute, Russian Federation Ministry of Health, Moscow; UDC 615.468.6:615.281.03].038]

[FBIS Abstract] The new anti-bacterial suture material kapromed was developed at the Medical Polymers Department of the All-Russian Medical Technology Scientific Research and Testing Institute in collaboration with the Surgical Department of the Moscow First Aid Scientific Research Institute imeni N.V. Skifosovskiy. The new suture material has prolonged anti-bacterial properties and is protected by Russian and foreign patents. Kapromed is manufactured by subjecting kapron fiber to acid treatment to loosen the surface of the kapron filaments. The filaments are impregnated with biocompatible copolymers containing antibacterial drugs and subsequently dried. Various types of kapromed are available as follows: AD (which contains 25 percent dioxidine by weight); ADKh and PTsDKh (which contain a mixture of dioxidine and quinoxidine); AG and PTsG (which contains 25 percent gentamicin by weight); AK (which contains kanamycin); ATs (which contains cefamezine); and kaproyod (which contains iodine). Kapromed is produced in sterile packaging in three sizes: 4/0, 3/0, and 1. After kapromed is implanted in body tissue, the copolymer swells and the antibacterial drugs contained in it are diffused from the polymer

coating. Kapromed's polymer coating is destroyed within 14 to 30 days after an operation. The acid treatment to which the kapron fiber is subjected accelerates the processes of its resolution, which is complete by 8 to 12 months after implantation. Kapromed exerts a local prolonged anti-bacterial effect. Tests in which the new suture material was used with 448 patients confirmed that kapromed helps reduce the incidence of postoperative wound complications to one-fourth of that occurring in a control group. Kapromed ADKh and AG were found to cause a slight aseptic inflammatory reaction, and kapromed MG was associated with very early activation of fibroblast processes with maturation of collagen fibers by day 7 after implantation. No side effects of kapromed PTsG or PTsDKh were observed. Tables 2; references 6 (Russian).

Ophthalmic Drug Films: Long-Term Results and Prospects of Their Use

947C0363F Moscow MEDITSINSKAYA TEKHNIKA
in Russian No 2, Mar-Apr 94 (manuscript received
17 Sep 1993) pp 34-36

[Article by Yu.F. Maychuk and A.M. Yuzhakov, Moscow Eye Diseases Scientific Research Institute imeni Gelmgolts, Russian Federation Ministry of Health; UDC 615.462.03:617.7.08]

[FBIS Abstract] Multiyear experimental and clinical studies of ophthalmic drug films have confirmed that such films are superior to other forms of eye drug administration on several counts. First, the films, which are based on polyacrylamide copolymers, make it possible to prolong a drug's effect for longer periods than is possible when other ophthalmic drug-prolonging agents (such as polyacrylamide, polyvinyl alcohol, vinylpyrrolidone, and methyl cellulose) are used. Second, ophthalmic drug films dissolve completely in the conjunctival sac. Third, ophthalmic drug films have a higher efficacy and lower toxicity than other forms of ophthalmic drug administration, and in many cases, they eliminate the need for conjunctival injections. Fourth, ophthalmic drug films are sterile and highly stable (while packaged, they retain their sterility for at least 2 years, and they remain fully effective for 12-24 months). Fifth, they eliminate drug-dosing errors (which can be as high as 30-40 percent in the case of ophthalmic drugs in drop or salve form). Sixth, they are an economical form of drug administration; for example, the duration of dexamethasone treatment required in cases of severe eye diseases may be reduced by a factor of 6.3 when the drug is administered in ophthalmic drug film form versus in the form of 0.1 percent dexamethasone drops. Ophthalmic drug films are not without their problems, however. The following problems related to their use have been noted. Problems have been encountered in developing commercially feasible packaging for the films. In addition, the films have been found to cause irritation of the conjunctiva, especially when the person applying the films is inexperienced. Such irritation generally disappears after 5-15 minutes, however. Films with lower drug

doses must be developed for use with pediatric patients. Further research is also needed with regard to introducing the films under the conjunctiva during surgery. Procedures for training medical personnel in the use of ophthalmic drug films must also be developed. Perhaps the biggest problem regarding ophthalmic drug film is the slow progress that is being made in expanding the arsenal of drugs available in ophthalmic drug film form. Table 1; references 28 (Russian).

Antimicrobial Resorptive Polymer Materials in the Prevention of Postoperative Complications in Abdominal Surgery

947C0363G Moscow MEDITSINSKAYA TEKHNIKA in Russian No 2, Mar-Apr 94 (manuscript received 1 Sep 93) pp 45-46

[Article by Yu.M. Polous, V.B. Goshchinskiy, and V.L. Napastyuk, Ternopol Medical Institute, Republic of Ukraine Ministry of Health; UDC 615.281.017:615.462/.03:617.55-089]

[FBIS Abstract] A total of 793 abdominal surgery patients (449 of whom underwent scheduled operations and 344 of whom underwent emergency operations) on whom the antimicrobial suture material kapromed was used were observed to assess kapromed's benefits. Among the 793 patients, 216 were operated on as a result of stomach and duodenal ulcers and 71 were operated on because of stomach cancer. During the surgeries on the said patients, various forms of the antimicrobial suture material kapromed (i.e., kapromed AG, kapromed ADKh, kaproyod, and kapromed MG) were used. The observations established that thanks to kapromed's distinctive physicochemical and biological features, the surgeons using it to form an anastomosis did not need to make a double-row Albert-Lembert suture. Instead, the surgeons were able to use a single-row serous-muscle suture. The kapromed suture material promoted faster tissue regeneration by removing the microbe factor and by permitting the formation of anastomoses that were twice as leaktight and strong as anastomoses produced by using other suture materials. By using a combination of anti-microbial filaments, an anti-microbial film, and an adhesive composite in a series of emergency stomach resections performed to treat perforated ulcers, surgeons were able to avoid failed sutures and anastomoses and the formation of inflammatory infiltrates in the abdominal cavity. The kapromed suture material proved equally effective in 64 appendectomy cases and was thus deemed an effective method of preventing postoperative complications of abdominal surgery. The 793 case observations established that when used as a suture material, kapromed reduces the incidence of anastomosis by a factor of 2-2.3. Kapromed suture material was also shown to reduce anastomosis deformation, mucous membrane erosion, and infiltrates in the abdominal cavity and surgical wound.

Microinstrument Kit for Ophthalmic Plastic Surgery

947C0363H Moscow MEDITSINSKAYA TEKHNIKA in Russian No 2, Mar-Apr 94 (manuscript received 4 Nov 1992) pp 46-47

[Article by L.N. Yevteyeva, T.N. Sviridova, and N.Kh. Musina, Medinstrument Scientific Production Association, Kazan; UDC 615.472.1:617.7-089.844]

[FBIS Abstract] The Medinstrument Scientific Production Association has become the first institution in the Russian Federation to develop a microinstrument kit for ophthalmic plastic surgery. The kit consists of 36 instruments as follows: 12 forceps, 4 types of scissors, 2 types of microsurgical needle holders, 2 blepharostats with 2 types of clamps, a tenaculum-spatula that has two working ends (one in the form of a double tenaculum and the other in the form of a button with a slot), 6 clamps for fixation of various parts of the eye, a perforated spatula, a knife for cutting out a transplant, a guide-knife to guide a transplant, 2 probes, and a plate to protect the eyeball during operations. With the exception of the plate and blepharostats (which are made of titanium alloy), all of the instruments in the kit are made of stainless steel. All of the instruments are sized and shaped to fit conveniently in the surgeon's hand. The instrument kit has been tested in clinical trials and has been positively received by leading clinics throughout the country, including the Eye Diseases Scientific Research Institute imeni Gelmgolts in Moscow, the Military Medical Academy in Saint Petersburg, and the Republic Clinical Hospital in Kazan. The instrument kit has been produced since 1992 at the Mikron Pilot Plant of the Medinstrument Scientific Production Association in Kazan. Figure 1.

Endovascular Laser Therapy for Primary Glaucoma

947C0381A Moscow VESTNIK OFTALMOLOGII in Russian Vol 110 No 2, Apr-Jun 94 (manuscript received 1 Jun 93) pp 7-8

[Article by I.A. Zakharova, Ye.A. Kartasheva, and V.Yu. Makhmutov, Ophthalmology Course, Advanced Physicians Training Department, Voronezh Medical Institute imeni N.N. Burdenko; UDC 617.7-007.681-021.3-085.849.19]

[FBIS Abstract] An LTM-01 helium-neon laser generating radiation in the red range of the spectrum with a wavelength of 680 nm and power output at the lightguide tip of 0.5 mW was used to administer endovascular laser therapy to 59 patients between the ages of 43 and 78 years who had been determined to have various forms and stages of primary glaucoma. Of the 59 patients, 51 had open-angle glaucoma, 8 had closed-angle glaucoma, and 7 had previously undergone surgical treatment. The efficacy of treatment was evaluated on the basis of the

dynamics of visual acuity, peripheral visual field boundaries, angioscotoma area, blind spot, ophthalmotonometry findings, and tonographic indicators. Conventional therapy and treatment involving the use of endovascular laser irradiation of the blood were compared. Endovascular laser irradiation of the blood resulted in a 2- to 6-mm Hg decrease in ophthalmotonus in all patients receiving the said therapy. In 26 patients in whom the initial stage of subcompensated primary open-angle glaucoma had been diagnosed, treatment was conducted before local application of miotic drugs. A distinct hypotensive effect was observed in 56 percent of the said patients. This hypotensive effect persisted for up to 2 months, after which patients' intraocular pressure gradually increased to levels necessitating the prescription of hypotensive agents. No statistically significant differences in visual acuity before and after treatment were observed in those patients receiving conventional treatment. Endovascular laser treatment also had positive effects on patients' blind spots and angioscotomas. According to the tonographic indicators studied, endovascular laser treatment had positive effects on the hydrodynamics of patients' eyes, and in five patients, secretion increased by a factor of 2-3. The endovascular laser treatment did not result in any statistically significant differences in boundaries of peripheral vision; however, in absolute numbers, one-third of the patients manifested an expansion of their peripheral vision boundaries by 10° or more and a decrease in central and paracentral scotomas. In three patients with paracentral scotoma who had been treated conventionally more than once, one course of endovascular laser therapy was sufficient to make their scotomas disappear. The studies confirmed that there is no need to institute general medicinal treatment at the time of laser irradiation because the laser treatment improves general hydrodynamics and the blood's microcirculation and coagulation properties, decreases the cholesterol level and vascular wall permeability, and increases the level of natural antioxidants and immunity. Endovascular laser therapy was thus recommended as part of the complex treatment of glaucoma patients. References: 5 (Russian).

Clinicoradiometric Studies of Eyes Exposed to Radioactive Contamination

947C0381B Moscow VESTNIK OFTALMOLOGII in Russian Vol 110 No 2, Apr-Jun 94 (manuscript received 14 Sep 93) pp 15-17

[Article by T.N. Mikhaylina and A.G. Bazhin, Biophysics Institute, Russian Federation Ministry of Health, Moscow; UDC 617.741-004.1-02:614.876-085]

[FBIS Abstract] A study examined the immediate and long-term effects of local radioactive contamination on the media and visual function of the eyes of 26 men aged 25 to 56 years who had gotten α - and β -active material in their eyes in aerosol, granular, or gaseous form as a result of accidents or safety rule violations involving radioactive materials. Other objectives of the study were to

determine which areas of the eye were most affected by radioactive contamination and to develop recommendations regarding methods of removing radionuclides from patients' eyes. The eyes of the 26 men were treated in stages. At a health center the men received first aid in the form of copious rinsing of the skin of their eyelids and orbital areas with tap water and washing with neutral soap. The mucous membranes of their eyes and eyelids were rinsed repeatedly with a physiological solution. Next, radiometry of the different sections of the men's eyes were performed under polyclinic and physics laboratory conditions. An SMB-12 miniature detector and BDZ_A-01 standard instrument unit were used to measure the radiation in the men's eyes. Next, the men's eyes were treated with a neutral soap suspension (containing a 2 percent soap solution) combined with vaseline oil to prevent dryness, loss of elasticity, maceration, etc. The radionuclides present in the men's eyes were removed by applying vaseline oil to the contaminated sections, emulsifying it with the neutral soap suspension, and completely removing the emulsate by means of moist cotton balls and a water rinse. The men's eyes were subjected to clinical examination by means of generally accepted ophthalmologic methods. Each man's eyes were examined between one and six times for 8 to 17 years after the contamination incident. The efficacy of using vaseline oil to treat the skin was also evaluated in laboratory experiments involving rats whose skin had been contaminated by a solution of ²³⁹Pu nitrate or a mixture of ²³⁹Pu and tributylphosphate. The highest levels of radioactivity were found on the skin of the men's eyelids and orbits, with especially high levels on the eyelashes and eyebrows. The men's corneas and conjunctival cavities contained the lowest levels of radionuclides. The follow-up examinations conducted 8 to 17 after the initial contamination confirmed that timely removal of radionuclides from the ocular surface is effective in preventing the development of specific symptoms and tropic changes in the ocular media, including epilation of the eyelashes, keratitis, retinopathy, or radiation-induced cataract. The method of using vaseline oil and soap to remove radionuclides from the men's eyes did not induce skin irritation, maceration, or discomfort in the patients treated with it. The efficacy of using a combination of vaseline oil and soap and water to remove radionuclides from the eyes was further confirmed in the rat studies. Table 1; references 15: 14 Russian, 1 Western.

Study of Proteolytic Enzymes and Their Inhibitors in the Tear Fluid in Cases of Inflammatory Cornea Diseases Resulting From Burns

947C0381C Moscow VESTNIK OFTALMOLOGII in Russian Vol 110 No 2, Apr-Jun 94 (manuscript received 15 Mar 93) pp 20-22

[Article by N.B. Chesnokova, doctor of biological sciences, T.P. Kuznetsova, physician, and N.Ye. Sosulina (deceased), candidate of biological sciences, Pathophysiology and Biochemistry Department (head, Prof. A.Ya.

Bunin), Moscow Eye Diseases Scientific Research Institute imeni Gelmgolts (director, A.M. Yuzhakov, doctor of medical sciences), Russian Federation Ministry of Health; UDC 617.7-001.17-092.9-092-07]

[FBIS Abstract] The corneas of 40 chinchilla rabbits weighing 2.5 to 3.5 kg each were burned by applying a thin 7-mm-diameter cotton disk that had been saturated with 10 percent NaOH to their corneas for 40 seconds while they were under general and local anesthesia. After the disks were removed, the rabbits' eye tissues were carefully rinsed with a physiologic solution. The rabbit's lacrimal fluid was collected by pressing filter paper disks to their lower conjunctival sacs and then placing the disks in test tubes containing a physiologic solution. Techniques described elsewhere were used to measure the activity of trypsin- and elastase-like proteinase and the antitryptic activity and level of α_2 -macroglobulin in the eluate. The clinical symptoms of burn disease were assessed by biomicroscopy after the corneas had been dyed with 0.5 percent fluorescein. Even though the procedure used to burn the rabbits was strictly controlled so as to ensure uniform burning of all of the rabbits' corneas, the burn disease resulting from the injury to the rabbits' corneas progressed very differently in the individual rabbits. In 8 percent of the rabbits, deep ulcers and perforations of the cornea developed within 2 weeks after the burn injury. In the remaining rabbits, corneal ulceration peaked on day 21. In half of the rabbits (group 1) ulceration of the superficial and medial layers of the corneal stroma developed, and in the other half of the rabbits (group 2) deep ulcerations and perforations developed. Proteolytic enzymes could not be detected in those rabbits with the most severe course of disease (8 percent of all those burned and studied) either before or after their corneas had been burned. Even before their corneas had been burned, the group 1 rabbits' trypsin-like activity was 32 percent lower than that of the group 2 rabbits, their antitryptic activity was 32 percent higher, and their level of α_2 -macroglobulin was 31 percent lower ($p < 0.05$). On days 1, 3, and 28 after the rabbits' corneas had been burned, those animals with the most serious course of burn disease had statistically significantly higher amounts of trypsin-like activity in their lacrimal fluid than did the rabbits with a less severe course of disease. Virtually throughout the course of the experiment, the group 1 rabbits had higher levels of antitrypsin activity and lower levels of α_2 -macroglobulin than did the group 2 animals. The study findings were interpreted as indicating a link between nature of the course of burn disease in the eyes and activity of trypsin-like proteolytic enzymes and antiproteinase in the lacrimal fluid. It was further concluded that trypsin-like activity, antitryptic activity, and the α_2 -macroglobulin level may be used as objective characteristics in predicting the course of the inflammatory process that occurs in the cornea and in determining the necessity and direction of proteolysis correction. Figure 1; references 22: 13 Russian, 9 Western.

Intravascular Laser Irradiation of Autologous Blood in the Treatment of Selected Eye Diseases

947C0381D Moscow VESTNIK OFTALMOLOGII in Russian Vol 110 No 2, Apr-Jun 94 (manuscript received 8 Apr 1993) pp 23-24

[Article by Ye.V. Yeliseyeva, Yu.A. Shusterov, candidate of medical sciences, and B.N. Vakhrushev, Karaganda Oblast Diagnostic Center (chief physician, Ye.K. Rakishev), Eye Diseases Department (head, Docent L.V. Mikhaylova), Karaganda Medical Institute, and Motorists' and Builders' Medical Unit (chief physician, M.P. Kulikov); UDC 617.7-085.849.19]

[FBIS Abstract] Thirty one patients (44 eyes) aged 15 to 68 years were divided into two groups. The 15 patients in group 1 (23 eyes) suffered from central nonexudative chorioretinal dystrophy and vascular opticopathy. The 16 patients in group 2 (20 eyes) suffered from keratitis, keratouveitis, and uveitis accompanied by impairments in their immune status. Because conservative therapy had been attempted and proved ineffective in all of the patients, the two groups of patients were treated with intravascular laser irradiation of their blood. All of the 31 patients underwent a treatment course consisting of 2 to 5 sessions of intravascular laser blood irradiation with a 1-day interval between sessions. A series-produced ALOK-1 low-power helium-neon laser (power output at the end of the lightguide, 0.7-1 mW; wavelength, 0.63 μ m) was used to administer the treatment under sterile conditions. During the sessions, the lightguide was inserted 3 to 7 cm into the patients' veins. Each irradiation session lasted 30 minutes. No complications developed in any of the patients during the irradiation sessions. The clinical examination of the group 1 patients included visometry, perimetry, ophthalmoscopy, biomicroscopy, and electroretinography studies. The clinical examination of the group 2 patients included visometry, perimetry, ophthalmoscopy, and biomicroscopy studies plus a series of immunologic studies. Specifically, tests were performed to determine the status of their cellular and humoral immunity, the reaction of passive hemagglutination in their blood serum and lacrimal fluid with various antigens, and the circulating immune complexes present in their blood serum. Intravascular laser blood irradiation produced positive changes in all of the patients as follows: The group 1 patients manifested improved visual acuity, widened visual field, and normalization of their electrophysiological parameters. The group 2 patients manifested improved visual acuity, rapid resorption of corneal precipitate, reduced injection of the eyeball and opacities in the vitreous body, quicker corneal epithelialization, and normalization of their blood and lacrimal fluid immunograms. The said positive effects were attributed to the laser's complex neurotrophic and immunomodulating effect. The technique of intravascular laser blood irradiation was recommended as simple and effective and deemed suitable for use on an outpatient basis. References 5 (Russian).

Efficacy of Transcutaneous Electrostimulation of the Visual System in Cases of Partial Optic Nerve Atrophy

947C0381E Moscow VESTNIK OFTALMOLOGII in Russian Vol 110 No 2, Apr-Jun 94 (manuscript received 4 Aug 93) pp 24-27

[Article by R.G. Yusupov, Z.M. Safina, and E.R. Muldashev, Russian Center for Plastic Surgery of the Eye, Ufa; UDC 617.731-085.844-036.8]

[FBIS Abstract] A study examined the results of the efficacy of single courses of transcutaneous electrostimulation in 260 patients (496 eyes) suffering from partial optic nerve atrophy of various origins. All of the patients were between the ages of 7 and 68 years (52 percent of them were between the ages of 20 and 40 years), and 97 percent of them had suffered from optic nerve atrophy for more than 1 year. The types/causes of the patients' optic nerve atrophy were as follows: retroblastular neuritis (48), anteroischemic neuropathy (8), surgically treated glaucoma (27), craniocerebral trauma (51), optochiasmatic arachnoiditis (24), viral infection (47), congenital optic nerve pathology (20), and pathology of unexplained etiology (35). Because preliminary calculations indicated that there is no significant correlation between the form of optic nerve atrophy, duration of disease, and effect of electrostimulation as estimated on the basis of change in visual acuity, all subsequent assessments of the efficacy of electrostimulation were made without consideration of those factors. Transcutaneous electrostimulation was performed for 8-10 days. A type ESO-2 two-channel electrostimulator (Rostov Neurocybernetics Institute) or Sunshine electrostimulator was used in all of the treatments. The stimulation parameters (eight output characteristics per channel) were selected on the basis of the individual properties of electrophosphene and other diagnostic criteria. Each patient's field of vision, electric sensitivity threshold, and electric lability with respect to phosphene was measured before and after electrostimulation, and Hanzfeld and macular electroretinograms were recorded for each patient in red and green light. The transcutaneous electrostimulation treatments caused statistically significant positive changes in all of the characteristics measured. The degree of the said changes was regularly dependent on the initial status of the patients' vision, especially on their initial visual acuity. The biggest improvements were observed in those patients with the lowest initial levels of visual acuity. The initial values recorded for patients' field of vision and electric lability were also significantly linked to the increase in visual acuity after electrostimulation. No link between initial values recorded for patients' electrical sensitivity thresholds or patients' starting electroretinograms and increase in visual acuity as a result of electrostimulation was found, however. In addition to confirming other researchers' findings regarding the efficacy of transcutaneous electrostimulation on various forms of optic nerve atrophy, the present studies confirmed that the degree of efficacy

of electrostimulation is determined by the condition of the patients' visual system (as expressed by vision impairments) before treatment. The normalizing effect that transcutaneous electrostimulation was observed to have on electric lability, Hanzfeld electroretinography, and macular retinography results was interpreted as evidence that electrostimulation improves the balance of the stimulatory and inhibitory processes occurring in the retina thanks to activation of efferent control of the retina by the superjacent structures of the visual system. Figures 5, tables 2; references 13 (Russian).

Focused Ultrasound: Experimental-Morphological Studies

947C0381F Moscow VESTNIK OFTALMOLOGII in Russian Vol 110 No 2, Apr-Jun 94 (manuscript received 4 Feb 93) pp 30-32

[Article by V.P. Yerichev, I.P. Khoroshilova, O.M. Kalinina, A.M. Bessmertnyy, L.V. Solontsova, and V.N. Dmitriyev, Moscow Eye Diseases Scientific Research Institute imeni Gelmgolts (director, A.M. Yuzhakov, doctor of medical sciences) and Acoustics Institute imeni N.N. Andreyev (director, N.A. Dubrovskiy, corresponding member of the Russian Academy of Sciences); UDC 617.7-007.681-085.837.3-036.8-07]

[FBIS Abstract] A study examined the histomorphological changes occurring in eye tissue subjected to focused ultrasound. The eyes of 20 sexually mature chinchilla rabbits were exposed to ultrasound. The focal zone was oval, measured 0.4 x 2 mm, and was located 1-1.5 mm from the limbus. An exposure time of 3 seconds and ultrasound power of 40 W were used. The ultrasound was administered in two applications each, and the focal zones were located at 12, 3, 6, and 9 o'clock. Morphological studies were performed on the dynamics of the pathological process at 24 hours, 3 days, 3 weeks, and 3 months after a one-time ultrasound effect. The rabbits were killed after the respective time intervals by an air embolism. Their eyes were inoculated, fixed in 12 percent formalin, dehydrated in alcohol, and poured into celloidin or paraffin. The media were dyed with hematoxylin and eosin. A total of 20 eyes were studied. The main morphological changes in the eyes after 24 hours were as follows: the conjunctiva over the ultrasound-affected zone was edematous and plethoric and infiltrated with neutrophils and lymphohistiocytic elements. Necrobiosis and swelling of the sclera characterized by a change in its tinctorial properties were observed. Homogenization and swelling of the collagen fibers was also observed. Alterations were present in the ciliary body in the form of a large edema of its stroma and moderate destruction of its pigment cells and accumulation of histiocytic elements in the outer layers. After 3 days, the conjunctiva over the focus of the ultrasound effect was edematous, and the epithelium covering the conjunctiva was preserved. A focus of coagulation necrosis with distinct edges corresponding to the ultrasound effect was observed in the sclera. Cellular elements were absent

from this focus, its layering was not differentiated, and its collagen fibers were swollen and without distinct boundaries. Pronounced destruction of the pigment cells persisted in the vicinity of the ciliary body. Three weeks after the ultrasound effect, that area of the sclera to which the ultrasound had been applied was thickened at its edges with a necrotized substrate. Isolated scleral layers between which neoplastic vessels and solitary lymphocytes were differentiated persisted in the deep layers of the sclera corresponding to the area where ultrasound had been applied. In the ciliary body there was active resorption of the destructive pigment cells and phagocytosis of the said cells along with the formation of aggregates of lumpy cells (melanophages) against a background of atrophy and partial hyalinosis of the stroma. Extensive hyperplasia of the epithelial cells with phagocytized pigment was observed in the area of injury of the unpigmented epithelium of the ciliary body. After 3 months, the sclera, which was covered by a newly formed, loose, small-celled fibrous episcleral tissue, was observed to have undergone limited thinning to its normal thickness at a distance of 1.5-2 mm from the limbus. An abundance of fibroblastic elements and solitary newly formed vessels were present in the thinned section of the sclera. The ciliary body (especially its flat part) had atrophied, and hyperplasia of the ciliary body was noted. The focused ultrasound did not appear to induce any changes in the lens. It was concluded that that focused ultrasound has at least two mechanisms of hypotensive effect on the eye: inhibition of secretion of intraocular fluid and creation of a transscleral path of discharge of chamber fluid. Figures 2; references 4 (Western).

Purulent Infection and Problems of Asepsis and Antisepsis

947C0368A Moscow ZDRAVOOKHRANENIYE
BELARUSI in Russian No 4, Apr 94 (manuscript
received 3 Dec 93) pp 40-45

[Article by A.I. Boris; UDC 617-022:616-089.165]

[FBIS Abstract] Purulent infection is one of the most complex and critical problems facing modern medicine. Purulent complications of operations, everyday and war wounds, various internal diseases, and the postnatal period lengthen healing times and threaten the lives of victims, patients, women who have just given birth, and newborns. It was not until the second half of the 19th century that microorganisms were determined to cause purulence in wounds and infection in blood. Tens of thousands of microorganisms are now known and differentiated from one another on the basis of shape, size, method of existence and multiplication, resistance to physical and chemical agents, and ability to induce disease. Microbes are classified as members of the plant world that multiply by cell division. It would be an error to consider all microbes our enemies. Many are useful and even necessary to human life. Staphylococci are

among the most frequent causes of purulent inflammation and have learned to counteract penicillin by producing the penicillin-destroying enzyme penicillinase. No less pathogenic are streptococci, which are known to play a role in the purulent inflammation of fatty tissue and in the development of erysipelas, angina, and scarlet fever. *Pseudomonas aeruginosa*, which has been classified as an opportunistic pathogenic organism, has recently become a great source of worry for surgeons. Most often, microbes and organisms enter the body through injured skin or mucous membranes; however, purulent infection can also penetrate the skin through the sebaceous and sweat glands. Infections resulting from contact with a patient suffering from sepsis are especially dangerous. Nosocomial infections, i.e., infections resulting from contact with patients in medical institutions, are an especially critical problem. The principle of preventing suppuration of wounds, which is termed antisepsis, was introduced by Lister in 1867 and entails a set of measures directed toward destroying the microbes in a wound. Antisepsis was soon followed by the concept of asepsis, which is aimed at preventing the microbial contamination of wounds by chemical and/or physical agents. Asepsis and antisepsis were not immediately accepted. Even during the first world war, many surgeons ignored both principles. Now, however, both methods are used simultaneously in both medical practice and industry (especially in the food industry). Despite the numerous guidelines and regulations regarding preventing nosocomial infection, the number of purulent complications of operations at various medical institutions still ranges from 2 to 20 percent or more. The only ways of reducing the incidence of infections of the abdominal cavity and surgical wounds are by completely replacing gauze dressings and surgical instruments, by wiping surgical instruments with chlorohexidine during the course of an operation, carefully isolating skin wounds, preventive application of antibiotics at the end of an operation, and having surgeons periodically wash their hands or replace their gloves. Operating team members must change into new sterile gowns before every new operation. Only those directly involved in an operation should be allowed into the operating room, and no one not in sterile clothing should enter the operating room. Postoperative patients should be examined to make sure that they are free of purulent infection before being brought into close proximity with other patients. Small hospitals do not always have surgical departments or dressing wards. When this is the case, separate rooms should be provided for patients suffering from sepsis. Although it appears simple and is described in guidelines down to its fine points, the strict system of preventing nosocomial infection is often violated. One commonly occurring problem is the subcutaneous injection of drugs intended for intramuscular injection and vice versa and use of the incorrect size of needle. All complications of injections should be a lesson for medical personnel, as should all other instances of violation of the basis principles of asepsis and antisepsis. Adherence to the said principles has become even more

important in these difficult times and should be adhered to as much as possible. For example, even if gloves are unavailable, medical personnel can still wash their hands and use antiseptics. The nature and frequency of the development of nosocomial infections depends largely on nurses. In addition to performing their basic duties, nurses supervise the work of the junior members of the medical service, monitor the sanitary and hygiene condition of departments, and sometimes act as nurse's aids. When doing so, they must strictly observe the rules of asepsis and antisepsis. References 7 (Russian).

Influence of Erosion Processes on Radionuclide Migration

947C0346A Minsk DOKLADY AKADEMII NAUK BELARUSI in Russian No 1, Jan-Feb 94 (Signed to press 18 Mar 94) pp 98-101

[Article by A. V. Matveyev, Institute of Geology, Geochemistry and Geophysics, Belarusian Academy of Sciences; UDC 631.4:502.5(476)]

[FBIS Translated Text] Radionuclide migration of varying intensity is continually proceeding within the Belarusian technogenic radioactive province [1]. Study of these processes has important significance to answering questions about sensible use of contaminated territories and reducing the unfavorable ecological consequences of the accident at the Chernobyl Nuclear Power Plant. Investigations carried out in this direction deal primarily with the features of vertical radionuclide redistribution, while movement of radioactive particles over an area has been examined thus far only in general form [1-7], even though the main factors influencing lateral transport are known [1,3].

There are no quantitative characteristics describing radionuclide migration over the Earth's surface and in the surface air layer because research on contemporary transport of matter in general, and in areas subjected to technogenic radiation contamination in particular, has been insufficient. It was not until recent years, when a collection of special large-scale maps was drawn up for certain regions stricken by the accident at the Chernobyl Nuclear Power Plant, that we were able to obtain quantitative characteristics of possible lateral transport of radioactive particles. As it turns out, water and wind erosion of soil is the leading factor in radionuclide redistribution. This conclusion is well confirmed by research carried out in the Volozhinskiy test range in 1989-1991. According to data obtained here, the maximum intensity of planar erosion is estimated at from 0 to 40 tonnes/ha/year. In Belarus as a whole, this indicator may on rare occasion attain 100 tons/ha/year or more. However, the dominant values of erosional washout everywhere, including the Volozhinskiy test range, are 0-10 tonnes/ha/year. Linear water flows move around 1 ton/ha/year in suspended and loaded state from the test range and from the entire republic. Wind erosion fluctuates within 0-0.7 tons/ha/year, while during dust storms 10 or more tons may be carried away from each hectare.

Because the listed forms of erosion processes predominantly affect the uppermost layer of blanket deposits—that is, the horizons to which technogenic radionuclides are presently confined, it would be natural to assume that radioactive particles should move within the overall mass of eroded material. Evidence of the fact that such a process occurs in reality can be found in the modern features of radionuclide distribution on the Earth's surface. Judging from [8], as well as from hipsometric and morphometric maps of the Volozhinskiy test range, and from field measurements of the exposure dose rate on different relief elements, extreme concentrations of Cs-137 on long slopes (over 500 m) tend to occur in the upper and middle parts of the zone within the study territory, characterized by a maximum concentration of radioactive elements, which extends meridionally through the population centers of Klerimonty, Pershay and Kamen. On short slopes the concentration of radionuclides increases toward the base of the slope. Sometimes maximum concentrations of radioactive elements occur in ravines near hills and ridges (Figure 1). In this case the difference in radionuclide concentration in different elements of a rough relief may reach 2-5 Ci/km².

In opposition to this, over relatively broad flat areas (in depressed ones as well), for example between Yashkovichi and Prudniki, the density of radionuclide contamination is generally low and relatively uniform.

Such a varying distribution of Cs-137 on rough and on level territories may be explained by washout of radioactive particles by planar water flows in the first months following the accident at the nuclear power plant, when radionuclides were concentrated right on the ground surface. Radioactivity in the floodplains of water channels was found to be reduced due to export of material by flowing water out of the study area.

Radionuclides are presently found in natural landscapes predominantly in bound form, within a layer down to 5 cm, while on plowland they are scattered within approximately the top 20-25 cm. This means that the effect of erosion processes on radionuclide redistribution has decreased; however, their quantity can still be significant wherever cereal and row crops are planted.

In order to estimate the intensity of such processes, we need to use the following data: large-scale maps showing radioactivity, intensity of soil erosion, elevated surfaces, thalwegs and ridge lines; it should also be kept in mind that around 60 percent of all transported material remains on slopes, 20 percent is retained in thalwegs, and 20 percent is carried out of the erosion systems [9].

With regard for everything above, radionuclide redistribution is calculated according to the following scheme. The total weight of the layer of deposits containing radioactive particles is determined over an area of 1 ha. This value is around 4,000 tonnes for plowland and 800 tonnes on land that is not plowed. Consequently given average washout of 10 tonnes/ha/year, around 300 tons/

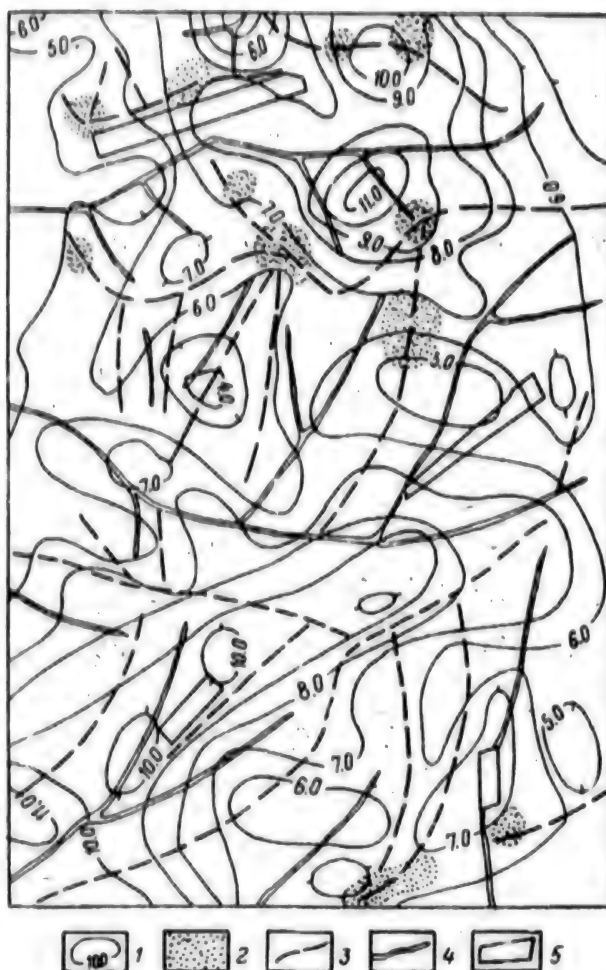


Figure 1. Radionuclide Distribution Over the Area of Occurrence of Ridged-Hilly Relief (Volozhinskiy Test Range):
1-cesium-137 terrain contamination density isolines; 2-elevated surfaces; 3-ridge lines; 4-thalwegs; 5-population centers

ha will be removed over a 30-year period—that is, this would be 7.5 percent on plowland and up to 37.5 percent of the entire weight of the layer containing radionuclides on land that is not plowed. Obviously the terrain's radioactivity will change in correspondence with this, naturally disregarding reduction of this indicator due to the half-life of the isotopes. However, it isn't really all that simple to calculate the influence of erosion processes on radioactivity, because a large number of local features of the ground surface need to be considered. For example, material may be transported into a closed depression, into a depression drained by a water channel (intermittent or permanent), over a long slope, and so on.

If drainage occurs into a closed depression (Figure 2a) with short slopes, calculation of radionuclide migration over plowland assumes the following form. 7.5

percent of the weight of the layer in which radionuclides are distributed will be removed from the southwestern and northwestern slopes (the entire system under examination here is within the zone of development of aquatic erosion processes with an intensity of 10 tons/ha per year), which will reduce contamination by 0.4 Ci/km²; however, radioactivity will grow by approximately the same amount in the depression. The contamination density on the southeastern and northeastern slopes will drop by 0.4 and 0.3 Ci/km² as a result of radionuclide migration. This indicator will grow correspondingly in the depression. The increase in radioactivity occurring due to erosion will of course be relative with regard for half-life, but cases are not excluded in which the radionuclide concentration may increase in absolute values as well. If a depression is drained by an intermittent or permanent water

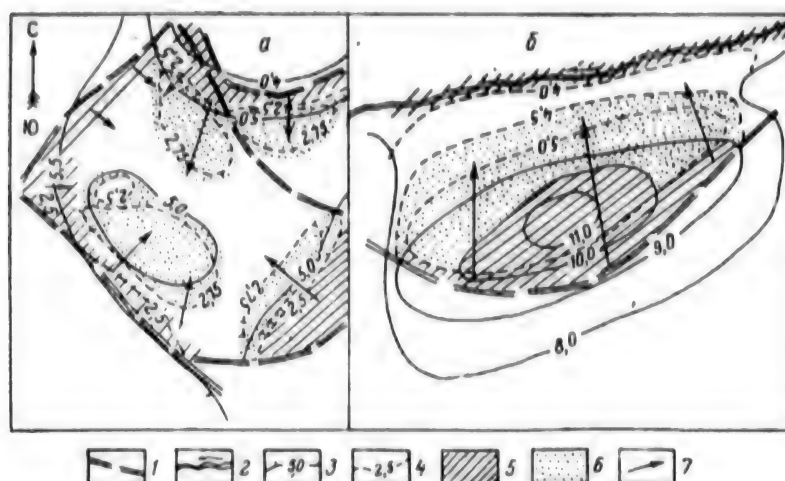


Figure 2. Prediction of Change in Cs-137 Contamination Density: a-closed depression; b-long slope. 1-ridge lines; 2-water channel; 3-modern Cs-137 contamination density isolines; 4-predicted Cs-137 contamination density isolines; territory in which relative decrease (5) and increase (6) of Cs-137 contamination density will occur; 7-main directions of removal

channel, the total growth of radioactivity will be 60-80 percent of the same indicator for a depression without an outlet.

Let us examine one more possible variant of calculating radionuclide migration occurring on a long plowed slope (Figure 2b) for which annual erosive removal is 10 tonnes/ha. In accordance with the particular features of the manifestations of soil erosion on the surface at the top of the slope and in the upper part of the slope, the density of Cs-137 contamination will decrease over a 30-year period by 0.7 Ci/km², which means that in the absence of planar removal and without regard for half-life, radioactivity lower down the slope where radioactivity was initially 10-11 Ci/km² would become 10.7-11.7 Ci/km². However, in reality these values would be approximately 5.4-5.8 Ci/km². Even further down the slope, following a similar line of reasoning, values of 4.4-5.0 Ci/km² could be reached, while at the base of the slope the actual radionuclide density would become less than 4.0 Ci/km² due to removal by water flow.

The effect of wind erosion on change in radioactivity is not that great, except in cases of dust storms, because wind transport of material could change contamination density by only 2-4 percent over the bulk of the territory within a 30-year period.

Thus it follows from the data presented above that erosion processes on intensively utilized territory may promote expansion of the area of radioactive contamination or an increase in contamination density. Therefore the technogenic load imposed upon the ground surface in such territories must be minimized. Introduction of new land into active economic use in contaminated regions appears especially unfavorable, because it would promote noticeable activation of lateral migration of radionuclides.

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PHARMACOLOGY AND PHYSIOLOGY

Antineoplastic Efficacy of Free and Liposome-Encapsulated Plaxant in A/He Mice With Ha-1 Tumor Metastasis in the Liver

947C0419A Kiev EKSPERIMENTALNAYA ONKOLOGIYA in Russian Vol 15 No 5, Sep-Oct 93 (manuscript received 21 Dec 92) pp 75-77

[Article by V.I. Kaledin, N.A. Popova, A.I. Stetsenko, and K.I. Yakovlev, Cytology and Genetics Institute, Siberian Department, Russian Academy of Sciences; UDC 616-006:615.277.3:546.92:577.353.24-615.015.35]

[FBIS Abstract] A study examined the anti-neoplastic efficacy of free and encapsulated plaxant when injected into mice with Ha-1 tumor metastases in their livers. The experiments were performed on 56 female A/He mice raised at the Cytology and Genetics Institute. Two forms of plaxant were studied: plaxant in its free form and plaxant encapsulated in a lipid film formed as follows: A film of 700 mg of lecithin and 100 mg of cholesterol was formed on the walls of a 1-l flask and then hydrated with 7 ml of a solution containing 120 mg of plaxant and 210 mg of mannitol. The mixture was stirred manually for 10 minutes, subjected to seven cycles of freezing in liquid nitrogen and thawing in a water bath at room temperature, and diluted in a physiological solution to a concentration of 9 mg of plaxant per ml, after which it was ready for administration. The tumor strain, which had been cryopreserved, was thawed and passaged in the mice in ascitic form. Each mouse was injected with 350,000 tumor cells after the ascitic fluid had been washed from them and they had been suspended in 0.4 ml of a 0.14 M solution of NaCl. The mice were then randomized into four groups: controls (group 1); mice receiving a single intravenous [IV] injection of free plaxant in a dose of 360 mg/kg (1 ml solution in a concentration of 9 mg/ml per 25 g of animal weight) on day 3 after the tumor cells had been intermingled with their own cells (group 2); mice administered the very same dose of plaxant but distributed in four intraperitoneal (IP) injections on days 3, 4, 5, and 6 after the tumor cells had been intermingled with the mice's cells (group 3); and mice injected with liposome-encapsulated plaxant in the same regimen used on the group 2 mice (group 4). All 14 mice in group 1 (the controls) died an average of 11.8 \pm 0.39 days into the experiment. Of the 14 mice in group 2, 35.7 percent died within 4 to 9 days into the experiment (i.e., 9 days after receiving the IV injection of free plaxant). Those group 2 mice that

managed to survive from plaxant's toxic effect died from metastases to their liver an average of 19.1 \pm 0.51 days after receiving the IV injection. Of the 14 mice receiving IP injections of free plaxant (i.e., the group 3 mice), 21.4 percent died from the drug's toxic effects, and those not succumbing to the drug's toxic effects died an average of 14.6 \pm 0.31 days into the experiment. Only 10.5 percent of the mice receiving the liposome-encapsulated plaxant (i.e., the group 4 mice) died as a result of plaxant's toxic effect. In addition, the group 4 mice lived the longest (i.e., until an average of 22.6 \pm 1.30 days into the experiment). The study thus established that like other anti-neoplastic platinum compounds, plaxant lends itself well to encapsulation in liposomes. Plaxant was also found to be at least as efficacious as other complex platinum compounds. Table 1; references 7: 6 Russian, 1 Western.

Visual Event-Related Potentials in the Mechanisms of Classification of Incomplete Images

947C0364A Moscow ZHURNAL VYSSHEY NERVOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian No 5, Sep-Oct 1993 pp 851-859

[Article by S.A. Lytayev and V. I. Shostak, S.M. Kirov Military Medical Academy, St. Petersburg]

[FBIS Abstract] The topographic brain maps and space-time parameters of various ERP (event-related potential) waves were recorded in the interval to 1000 ms after stimulus in the classification of visual images with an incomplete set of signs. The characteristics of event-related bioelectrical activity were recorded in 16 healthy, young adults in their perception of recognizable and nonrecognizable visual images. The sequential brain maps and the amplitude-time parameters of waves of late negatization (400-1000 ms) were estimated with the establishment of their relationships with the early and intermediate ERP components. The most specific indicator of the perception of nonrecognizable images was found to be the negative wave with peak latency at 400-500 ms (N_{450} , which, in the process, exhibits a notably greater amplitude. The observation that component N_{350} has a greater amplitude in the case of correct recognition of an image is seen as the completion of the processes of invariant evaluation of the signal at this stage. The early and intermediate components in the classification of visual images characterize the mechanisms of selective understanding, while the late waves (600-1000 ms) reflect the processes of "an exhaustive search" for the purpose of categorizing the incoming information. Components N_{70} and N_{150} , respectively, reflect the initial and intermediate mechanisms of selective understanding, which, in turn, are dependent on the perception processes being completed. The completed invariant recognition is accompanied, to a great degree, by the activation of N_{150} , while the incomplete categorization is characterized by a facilitation of N_{70} with a subsequent oppression of the amplitude of N_{150} in the associative cortex. Figures 3; references 25.

Role of Cyclic AMP in the Electrophysiological Effects of Morphine and Enkephalins

947C0364B Moscow ZHURNAL VYSSHEY
NERVNOY DEYATELNOSTI IMENI I.P. PAVLOVA
in Russian No 5, Sep-Oct 93 pp 946-952

[Article by Ye. I. Solntseva, Institute of Brain Research,
Russian Academy of Medical Sciences, Moscow]

[FBIS Abstract] The electrophysiological effects of morphine and enkephalins, which were recorded in the neurons of a region G snail and which can be attributed to a decrease in the level of cyclic AMP in the cytoplasm, are examined. Among the effects of morphine and enkephalins are membrane hyperpolarization, the elimination of bursting activity, and a reduction in the amplitude of the excitatory responses to serotonin (5-OT) and dopamine (DA). Following are the experimentally derived proofs of the fact that the inhibition of adenylate cyclase is the most probable mechanism for the reduction of the excitatory responses to the application of 5-OT and DA under the effect of morphine and enkephalins: the intracellular injection of cAMP or the extracellular application of dibutyl-cAMP simulate the excitatory 5-OT and DA responses, the phosphodiesterase inhibitors of cyclical nucleotides of theophyllines and isobutyl methylxanthines potentiate the 5-OT and DA responses, morphine and enkephalins—in a naloxone-dependent manner—inhibit 5-OT and DA responses, the dose-effect curves for 5-OT in the control and in the presence of morphine point to the incoherent nature of the inhibition, and the morphine and enkephalins do not effect the cAMP of the responses. These experiments were conducted jointly with V. M. Bulayev; the identification of the snail neurons were based on the classification devised by D. A. Sakharov. References 32.

Antithrombotic and Thrombolytic Activity of Tuftsin

947C0394A Moscow BYULLETEN
EKSPERIMENTALNOY BIOLOGII I MEDITSINY
in Russian No 11, Nov 93 (manuscript received
9 Jun 93) pp 451-452

[Article by L.A. Lyapina, V.Ye. Pastorova, M.V. Kondashevskaya, B.A. Kudryashov, V.N. Kalikhevich, A.A. Kamenskiy, and I.P. Ashmarin, Human and Animal Physiological Chair, Biology Department, Moscow State University; UDC 612.115-01:577.112.6]

[FBIS Abstract] Tuftsin, which is a peptide with the amino acid sequence Thr-Lys-Pro-Arg, has been shown to be capable of depolarizing fibrin and preventing its polymerization. In vivo experiments were conducted on 75 female rats (weighing 180 to 200 g each) to evaluate tuftsin's antithrombotic and thrombolytic activity. Tuftsin was administered to the rats intravenously in doses of 0.5 ml per 200 g of body weight (250 µg/kg). The

rats were injected with the tuftsin 5 minutes before being injected with tissue thromboplastin (in the experiments to determine tuftsin's antithrombotic activity) or 10-15 minutes after the formation of a jugular vein thrombus (in the experiments to determine thrombolytic effect). In the thrombolysis experiments, a segment of thrombus-containing vein was excised from each of the study rats 4-5 hours after they had received the tuftsin. The vein segments were dried at 37°C for 24 hours and were then weighed. Instead of tuftsin solution, the control rats received 0.85 percent NaCl. The experiments confirmed the results of published studies. Specifically, tuftsin in a final concentration of 10^{-1} to 10^{-3} lengthened the time required for recalcification of normal blood plasma by 25 percent on average. When administered in a dose of 50 µg per 200 g of body weight, tuftsin had a statistically significant ($p \leq 0.05$) antithrombotic effect in all of the rats receiving it. In the study animals, tuftsin had an antithrombotic effect averaging 20 percent higher than in the control group. In other words, shock developed in 5 of the 7 control rats injected with thromboplastin, whereas tuftsin prevented the development of shock in all of the rats that received tuftsin before being injected with thromboplastin. Tuftsin was further shown to have a thrombolytic effect in doses as low as 50 µg per 200 g of body weight. The thrombi of the animals injected with tuftsin weighed 26 percent less than those in the control animals. The experiments thus confirmed that in addition to possessing anticoagulant and fibrinolytic properties under in vitro conditions, tuftsin also possesses antithrombotic and thrombolytic properties under in vivo conditions. Table 1; references 11; 9 Russian, 2 Western.

Effect of Inhibition of Ca^{2+} Mobilization and Chemically Controlled Entry of Ca^{2+} Into the Cytoplasm on Modulation of the Plasticity of the Neuronal Choline Receptors of Edible Snails (*Helix lucorum*) by 15-Hydroxy-Eicosatetraenoic Acid

947C0394B Moscow BYULLETEN
EKSPERIMENTALNOY BIOLOGII I MEDITSINY
in Russian No 11, Nov 93 (manuscript received
24 May 93) pp 508-510

[Article by A.S. Pivovarov and U. Ekhido-Villarreal, Higher Neural Activity Chair (head, Prof. V.V. Shulgovskiy), Moscow State University imeni M.V. Lomonosov; UDC 612.822.3.014.46:[615.31:547.295.96].08]

[FBIS Abstract] A study examined the effects of inhibition of Ca^{2+} mobilization and chemically controlled entry of Ca^{2+} into the cytoplasm of edible snails (*Helix lucorum taurica Kryn*) on modulation of the plasticity of their neuronal choline receptors by 15-hydroxyeicosatetraenoic acid [15-HETE]. The experiments were conducted on the right Pa3 and left Pa3 neurons of edible snails in a preparation of isolated ganglia. The preparation was washed in Ringer's solution, and transmembrane ionic currents were measured by the method of two-electrode fixation of the potential in the membrane.

Choline receptor plasticity was evaluated by the extinction of acetylcholine [ACh] current developed during the process of application of ACh to the soma by local microiontophoresis at cationic currents of 686 to 1,042 nA. Each series included 11-13 successive ionophoretic applications of ACh current of the same direction, strength, and duration. The first 10 stimuli were suppressed at an interval of 60-240 (117.0 \pm 8.0) seconds to extinguish the ACh current. Subsequent stimuli were applied at 10-minute intervals to assess the degree and speed of restoration of the extinguished reaction. The modulating effects of 15-HETE were evaluated after the following preliminary pharmacological effects on the concentration of calcium in the neuron: 1) a modified calcium-free solution (the concentration of bivalent cations in it was compensated for by Mg^{2+} ions); 2) Ca^{2+} -tetracaine (an inhibitor of Ca^{2+} -dependent mobilization); and 3) TMB-8 (an inhibitor of the IP_3 path of Ca^{2+} mobilization). Experiments were performed on 40 neurons (23 right Pa3 and 17 left Pa3 neurons) from 40 ganglion preparations, and the effects of 15-HETE were tested in a calcium-free solution on 10 cells, after the addition of tetracaine on 14 cells, and after the addition of TMB-8 on 16 cells. Tetracaine and TMB-8 disturbed the long-latent modulatory effects of 15-HETE but did not influence its short-latent modulatory effect. Extraction of Ca^{2+} from the extracellular solution did not affect the modulating effect of 15-HETE. It was therefore concluded that inhibition of the mobilization of intracellular Ca^{2+} along paths dependent on Ca^{2+} and IP_3 disturbs the modulatory effects of 15-HETE on choline receptor plasticity in the second phase of its effect but does not affect modulation in the first phase. Finally, it was concluded that one of the mechanisms of intensification of the choline receptor plasticity due to 15-HETE in the second phase of its effect involves potentiation of the mobilization of Ca^{2+} deposited by 5-lipoxygenase eicosanoids along Ca^{2+} - and IP_3 -dependent routes. Figures 3, tables 2; references 12: 5 Russian, 7 Western.

Inhibition of Development of Experimental Tumors of the Uterine Cervix and the Vagina by Tinctures From the Biomasses of Cultured Cells of Ginseng and Its Germanium-Selective Stock Cultures

947C0394D Moscow BYULLETen
EKSPERIMENTALNOY BIOLOGII I MEDITSINY
in Russian No 11, Nov 93 (manuscript received
9 Jun 93) pp 534-536

[Article by V.G. Bespalov, V.V. Davydov, A.Yu. Limarenko, L.I. Slepyan, and V.A. Aleksandrov, Preclinical Testing Laboratory (head, Prof. V.A. Aleksandrov), Oncology Scientific Research Institute imeni Prof. N.N. Petrov, Russian Academy of Medical Sciences, and Physiology Department (head, Prof. V.V. Davydov), Pharmaceutical Chemistry Institute, Russian Federation Ministry of Health, Saint Petersburg; UDC 618.1-006-092:615.015.89]

[FBIS Abstract] A study compared the anticarcinogenic activity of three ginseng tinctures obtained by plant cell biotechnology. For the experiments, squamous cell carcinomas of the uterine cervix and vagina were induced in SHR female mice by intravaginal applications of the carcinogen 7,12-dimethylbenzanthracene [DMBA] (Sigma, United States). Three ginseng preparations were cultured: BZh, BZh-5, and BZh-13. BZh was produced by culturing cells of the root of *Panax ginseng* C.A. Mey. BZh-5 and BZh-13 were produced by culturing ginseng root cells together with one of two organogermanium compounds as follows: 1-hydroxygermatrane and 2-carboxyethylgermsesquioxane. Nine groups of mice (with 20 to 40 mice in each group) were studied. Group 1 mice received DMBA alone by mouth, the mice in groups 2 through 4 received DMBA plus one of the three ginseng tinctures, group 5 mice received DMBA alone vaginally, the mice in groups 6 through 8 received DMBA plus one of the three tinctures in vaginal applications, and the group 9 mice were left intact as controls. DMBA induced cervical or vaginal tumors in between 19 and 66 percent of the mice in each of the groups receiving it. Oral administration of BZh and BZh-13 reduced the incidences of carcinoma development and mortality in the two groups in which they were administered; however, the reductions in the incidence of carcinoma development/mortality as compared with that in the control group 1 were not statistically significant. BZh-5 failed to have any effect on neoplasm development. In control group 5, tumor development was significantly more rapid than in control group 1. This increased pace of tumor development was attributed to the promoting effect of tissue and muscular irritation resulting from the use of vaginal tampons to administer the DMBA. When administered vaginally, all three ginseng preparations (i.e., BZh, BZh-5, and BZh-13) resulted in a statistically significant decrease in the incidence of cervical and vaginal carcinoma and death therefrom. BZh resulted in 25 and 35 percent decreases in carcinoma development and mortality, respectively; BZh-5 resulted in 36 and 47 percent decreases, and BZh-13 resulted in 31 and 42 percent decreases in the same indicators. Table 1; references 17: 7 Russian, 10 Western.

Morphochemical Manifestations of the Chronic Effect of Amphetamine in Brain and Their Correction With Delta-Sleep Peptide

947C0394E Moscow BYULLETen
EKSPERIMENTALNOY BIOLOGII I MEDITSINY
in Russian No 11, Nov 93 (manuscript received
27 Apr 93) pp 555-557

[Article by L.M. Gershteyn, A.V. Sergutina, and V.I. Rakhmanova, Brain Scientific Research Institute (director, O.S. Adrianov, academician, Russian Academy of Medical Sciences; UDC 612.82.018:577.175.523:019.08]

[FBIS Abstract] A study examined the morphochemical response of selected brain formations to chronic amphetamine use and the corrective effects of delta-sleep peptide on the said responses. The experiments were performed on four groups of Wistar rats weighing 200 to 250 g each. Group 1 rats served as controls. The rats in group 2 received a single intravenous injection of amphetamine in a dose of 2.5 mg/kg body weight. The animals in group 3 were subjected to chronic amphetamine administration in daily doses of 2.5 mg/kg body weight. The animals in group 4 were also subjected to chronic amphetamine administration in the same dose as the group 3 animals; however, the group 4 animals also received injections of delta-sleep peptide (in a dose of 60 µg/kg body weight) for 3 days before being killed to permit examination of their brains. One-time injection of amphetamine caused a statistically significant increase in the amount and concentration of protein in the rats' brains, as well as a statistically significant increase in the dimensions of the cytoplasm of the neurons of just the third layer of the sensory-motor cortex. A statistically significant increase in the dry mass and concentration of proteins in the nuclei of the neurons of all of the formations studied was also noted. At the same time, there was an increase in aminopeptidase activity in the neurons of the sensory-motor cortex, caudate nucleus, and *n. accumbens*. Chronic amphetamine injection was found to induce a complex pattern of alteration in morphochemical indicators. As in the case of one-time injection, the biggest reaction from the standpoint of the type of activation was observed in the cytoplasm of the neurons of layer 3. In layer 5, there were changes related to the type of shortage. In the caudate nucleus, on the other hand, the decrease in the dimensions of the neurons' cytoplasm was accompanied by an increase in the amount and concentration of proteins. Aminopeptidase activity in the neurons of the formations studied in the mice subjected to chronic amphetamine administration was practically the same as in the respective neurons of the control animals. Against the background of chronic amphetamine administration, the three injections of delta-sleep peptide largely (albeit not completely) normalized the morphochemical changes in layer 3 of the sensory-motor cortex. No normalization of

morphochemical indicators in layer 5 or in the caudate nucleus was observed, however. Injection of delta-sleep peptide did not result in any statistically significant differences in aminopeptidase activity from the control levels. The results obtained in the experiments were said to be consistent with those published in works by neurophysiologists. Tables 3; references 5 (Russian).

Feasibility of Enhancement of Experimental Animal Radioresistance by MIGI-K

947C0345A Minsk DOKLADY AKADEMII NAUK
BELARUSI in Russian Vol 38 No 1, Jan-Feb 94
(manuscript received 21 Dec 1992) pp 83-86

[Article by Academician Ye. F. Konoplya, G. G. Gatsko, L. M. Mazhul, V. Ye. Volykhina, V. V. Gulko, and Ye. N. Goncharenko, Institute of Radiobiology, Belarus Academy of Sciences; UDC 577.391.547.915.511.111]

[FBIS Abstract] MIGI-K is made from active mussel biofiltrates containing large amounts of trace elements, antioxidants and other biologically important compounds, and there is a State standard for it as a foodstuff. An experimental study of the effect of MIGI-K on radioresistance following acute and chronic total-body exposure to low doses of radiation was made, using the lipid peroxidation system of rat blood to test properties of this product. Rats were exposed to either a single dose of 1 Gy gamma radiation, or chronic exposure in a dosage of 2 Gy in 42 days. MIGI-K was added to the rats' water feeder for 30 days prior to irradiation. Assays were made of blood levels of diene conjugates, malonic dialdehyde, antioxidant activity, cholesterol, high-and low-density lipoproteins, using heparin-manganese precipitation. Without MIGI-K the single dose of radiation caused considerable decrease in antioxidant activity of water-soluble blood constituents, with a tendency toward increase in products of lipid peroxidation. With MIGI-K no changes in tested parameters were noted, indicating that this product prevented activation of lipid peroxidation. In the case of chronic exposure to radiation, concurrent intake of MIGI-K prevented the atherogenic changes induced by chronic exposure alone. Illustrations 2; references 8 Russian.

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